Acknowledgments and Sponsors

Arctic 50th Historical Symposium Planning Team

Jay Slack, Director, National Conservation Training Center, U.S. Fish and Wildlife Service

Steve Chase, Chief, Division of Education Outreach, National Conservation Training Center, U.S. Fish and Wildlife Service

Dr. Mark Madison, Service Historian, National Conservation Training Center, U.S. Fish and Wildlife Service

Jimmy Fox, Region 7, U.S. Fish and Wildlife Service

Maureen Clark, Arctic 50th Coordinator, Region 7, U.S. Fish and Wildlife Service

Sarah Gannon-Nagle, Strategic Communications Manager, National Conservation Training Center, U.S. Fish and Wildlife Service

Thelma Flynn, Event Planner, National Conservation Training Center, U.S. Fish and Wildlife Service

Dr. Jim Siegel, National Conservation Training Center, U.S. Fish and Wildlife Service

Juanita Gustines, National Conservation Training Center, U.S. Fish and Wildlife Service

Susan DeStephanis, National Conservation Training Center, U.S. Fish and Wildlife Service

Special thanks to:

Geoff Haskett, LaVerne Smith, and Todd Logan, U.S Fish and Wildlife Service, Region 7, Mike Boylan, Richard Voss, Larry Bell

Sponsors

U.S. Fish and Wildlife Service

National Conservation Training Center

Arctic National Wildlife Refuge

The Conservation Fund

Voices of the South

And for their efforts and support of this symposium, thanks to:

All of our speakers
Jay Slack
Jim Willis
Kelly Kennedy
Rollie Jacobs
Beth Stevens
Christine Eustis
Karin Christensen
Chris Horsch
Kris Hoellen
Jeanne Harold
Keenan DeLawder
Steve Duerr, The Murie Center
Richard DeVries
Kelly Fike
Mike McAtee
Ryan Hagerty
Clayton McBride
Todd Harless
Keith Mantheiy
Thelma Flynn
Beth Ann Ring
Laura Creamer
Becky Edgar
Marca Piehuta
Georgia Jeppesen
Dawn Lagrotteria
Alicha Burlett
Kerrick Reisbig
Gail Testa
Andrew Weinberg
George Krull
Ben German
Tara Lowe
Cynthia Fraula-Hahn
David Klinger
Shepherd University Department of Contemporary Art and Theater
Patrick Wallace
American Conservation Film Festival
NCTC ARAMARK Staff
NCTC Raven Services Staff
NCTC Security Staff

Introduction to the Transactions:

"For the immediate present, the most pressing need is to establish and maintain for scientific use an undisturbed research area of adequate size in the heart of the last and greatest remaining Arctic Wilderness region. For the future needs of Alaska and the entire nation, this superb area should be planned and dedicated now for perpetual preservation as a scientific field laboratory and also for the education, enjoyment, and inspiration of all outdoor minded people." —George Collins and Lowell Sumner

For more than a half-century Americans have studied Arctic Refuge, visited it, and described it. Yet Arctic's size and scope defy easy definition. The story of Arctic National Wildlife Refuge is a tale of conservationists and visionaries.

In 1953 George Collins and Lowell Sumner began to advocate an ecosystem-sized, protected area in the far reaches of Alaska. Three years later, Olaus and Margaret Murie, accompanied by three young graduate students, spent a season living on the south slope of the Brooks Range, studying and experiencing the unique qualities that only a land untrammeled by civilization could provide. The film of their experiences, "Letter from the Brooks Range," helped Americans visualize for the first time this remote wilderness landscape.

The early cohort who fought for Arctic Refuge were themselves an example of diversity. Supreme Court Justice William O. Douglas, who visited the Muries in 1956; A. Starker Leopold, son of Aldo Leopold; Alaskan conservationist Ginny Wood; and English ornithologist and ecologist F. Fraser Darling were some of the earliest voices for creation of a unique refuge in this place.

Their efforts came to fruition in December 1960, when Secretary of the Interior Fred A. Seaton signed an order protecting the 8.9 million acre Arctic National Wildlife Range, calling it "one of the world's great wildlife areas." In 1980, President Jimmy Carter signed landmark legislation, the Alaska National Interest Lands Conservation Act, which created the 19.6-million-acre Arctic National Wildlife Refuge and designated 8 million of those acres as wilderness.

Three decades later, the Arctic National Wildlife Refuge stands as testament to the vision of Leopold, Collins, Sumner, the Muries, Douglas, Seaton, Carter, and several generations of Alaskans. It is a wild place where man has left little sign of his vast civilization, providing a rich ground for scientific study, biodiversity, adventure, inspiration, and imagination... a place where wild nature still flourishes, waiting the discovery of future generations.

In January of 2011, the National Conservation Training Center and the Arctic National Wildlife Refuge presented the Arctic National Refuge 50th Anniversary Historic Symposium in Shepherdstown, West Virginia. NCTC is home to the U.S. Fish and Wildlife Service and is a center for the history of the Service and the American conservation movement. The NCTC has a 15-year tradition of commemorating important historic milestones and figures in American conservation. Arctic is one of the Service's greatest stories.

The symposium was planned to share that history with many of the living principal players and the legions of wilderness aficionados who see Arctic Refuge as a crown jewel of the American wilderness system. These 150 or so participants were a "who's who" of the conservation and wilderness fields. This document attempts to capture the spirit and scholarship of this seminal event, and its publishing in 2014 is especially relevant as we celebrate the 50th Anniversary of the signing of the Wilderness Act, one of the great conservation laws of the twentieth century.

For three days symposium participants explored and discussed the history, science, and uniqueness of Arctic National Wildlife Refuge. Some highlights included a fascinating conversation with Arctic refuge managers, including the legendary Ave Thayer; the Voices of the South's play Wild Legacy, with George Schaller and Bob Krear, two characters in the play, actually in the audience; a screening of the film America's Wildest Refuge: Discovering the Arctic National Wildlife Refuge; and a visit from Jimmy Carter, the 39th President of the United States.

Day one featured America's finest conservation historians and some of its most prominent conservation leaders, who told stories of the arduous and trial-marked creation of Arctic National Wildlife Refuge. Day two examined the unique place that is Arctic through the eyes of former refuge managers, early and contemporary explorers of the refuge, and writers and academics who have made the refuge and its intangible values a focus of their scholarship. The final day examined the rich scientific heritage of Arctic Refuge as we heard from prominent scientists who have studied the birds, fish, mammals, geology, and climate of this wild landscape over the last 50 years. These speakers also addressed future scientific programs at the refuge and conservation challenges to its delicate ecosystem.

For 50 years the Arctic National Wildlife Refuge has stood as a place rich in wildlife, spectacular scenery, rugged landscapes and what Olaus Murie called "intangible resources." In addition to its rich natural history, the refuge is also an important repository of cultural history. We welcome you, through this document, to relive those extraordinary three days.

Arctic National Wildlife Refuge is important not only for its immense physical size but also for the monumental impact it has had in shaping our understanding of refuges, wildlife, wilderness and the American spirit.

Steven Chase, Mark Madison—Organizers

Welcome from Jay Slack and LaVerne Smith

USFWS/Ryan Hagerty

NCTC Director Jay Slack

Jay Slack: Let me start by saying, welcome to the National Conservation Training Center. I'm Jay Slack; I'm the Director here at the Training Center. We, from time to time here at NCTC, have these historic symposia. This is the fifth one that we've done, and we're proud to be able to put this one on for the Arctic National Wildlife Refuge 50th Anniversary. We have a huge list of folks here that have come a long ways, and we appreciate you coming. I'll start, before I talk a little about the symposium, with a little bit of background about NCTC. I know about half of you, and others I'm still looking forward to meeting. This is our training center for the Fish and Wildlife Service, so we do the training for our agency here, and we do that both in classrooms here and on the road out to the regions and different stations around the country. We also do what we call affectionately "Distance Learning," a lot of online training for our agency as well. So, training center, that's one thing, but the other thing that we do here is we host events like this, and we host meetings for folks in the conservation profession. So, what we're trying to do as an agency is also use this facility to further our mission in conservation. You're participating in one of those events, so welcome.

For the next three days, we're going to celebrate the historic and scientific legacy of the largest intact wilderness area in the United States, the Arctic National Wildlife Refuge. The refuge has a rich history of stories: stories from Native Americans who've lived and hunted on the refuge, scientists who've studied the extensive natural and geological features of the refuge, and adventurers who've sought the solitude and the intrinsic values of the wilderness area and the refuge.

The refuge is certainly one of the most majestic places that are on this planet, and we're celebrating that. It is a national treasure for the people of the United States and of the world, and perspectives of those people are as diverse as the people and as diverse as the landscape of the refuge itself. But no matter which point of view you've come from, obviously that value of the refuge is there, and it is tremendous.

Our focus for this symposium over the next few days will be on the value of that place, the people that visit, the people that live there and exist there, the science surrounding the refuge, its exploration, and its current scientific value, and natural value, obviously.

We have an extraordinary lineup of speakers; you've all seen the program: national leaders, historians, field biologists, refuge managers, writers, filmmakers, and adventurers. Each of those people have their unique perspective and views on the refuge, and we're trying to set a backdrop where we can hear about all of those views and all of those values that those people hold dear about the place.

Finally, we recognize the place as a national treasure; obviously, protecting a national treasure is an important thing. The state of Alaska has a huge, huge role in the conservation and the value of that place, and so we recognize the state of Alaska as this huge force in the conservation of the refuge as well. Basically, the place inspires enthusiasts of all sorts as well as scientists, whether they've had the opportunity to visit the place or not; I think we all hold that place dear. I myself have not been there but have lived vicariously through those who have, and the films that we will see, the photo exhibits that you'll see, will help bring that to you if you haven't had the opportunity to actually experience it yourself. So, we're trying to do our part to make the place available for all of you until you're able to get there.

We hope the event will not only inspire you and enrich your connection to the Arctic, but we also think that it's important not only to look back—we're talking about the history in this symposium—but we also want to talk about the future. When you look back, I think it's important to

look forward, and we're trying to make that possible, too. So, over the next few days that you're here, we encourage all of you to get to know the other participants who are here. You will see that we have made special provisions to have many youthful participants here; we have students from all different backgrounds and all different places, and we encourage all of you that have been involved with the Arctic to reach out to those students. They're the future conservationists and future leaders in conservation, and we have the opportunity over these few days to mentor them, tell them a little bit about what experiences are there and the values that are there. So, if you would, please, please reach out to those students. We think it will probably put perspective on where you've been in the history, and also help them move forward in their careers.

So with that, I'd like to say a couple of special thanks. Steve Chase is the Chief of the Division of Education and Outreach here; he and his staff have spent a huge amount of time making this happen over the last months and weeks, so thank you, Steve. If you have a chance to meet Mark Madison, he's the Chief Historian for the Fish and Wildlife Service, and Steve's staff has been working tirelessly to make this happen for you. And then all of the NCTC staff, obviously. They have been working with the Fish and Wildlife Service folks in Region 7, in Anchorage and throughout Alaska, to make this happen. This is really a partnership, with NCTC being able to host it and help put it together, but the heart and soul of the people that are actually working there, working in the program in Alaska, have really been the driving force in this. So, we want to say thanks to the Fish and Wildlife Service employees in Alaska, and to represent them I'd like to introduce our first invited speaker, LaVerne Smith, Deputy Regional Director in Alaska, Fish and Wildlife Service Region 7 in Anchorage. She has had a long and distinguished career with the Fish and Wildlife Service; she's a career Fish and Wildlife Service employee. I've known her for a long time, maybe… at least a long time, a long time! She's spent a tremendous amount of her career working in the Endangered Species Program; she also has worked in the Partners for Fish and Wildlife Program. Most recently, she went to Alaska, where she served as Assistant Regional Director, and now as Deputy Regional Director. LaVerne is one of these people that puts her heart and soul into conservation, and we're really happy to have her here today, and we're happy to have her as part of the Service family. So, LaVerne, thank you and welcome.

LaVerne Smith: I think the Alaska region has actually been having a really fun time celebrating the 50th Anniversary of the Arctic Refuge. We began our celebration back in early December in both Alaska and different cities as well as in Washington, D.C. with the premier of the film *America's Wildest Refuge*. Also, we had showings of the beautiful photographic exhibit *Arctic Sanctuary*, and a play was presented, *Wild Legacy*. You are all in for a treat because you get to see all three of those in one place, and it's an amazing collection of work that's been done in honor of the 50th Anniversary of the Arctic Refuge. I think this week's symposium, though, is really probably the centerpiece of our celebration, where all of these different pieces come together in one place. If you look out over the room and the agenda, it's amazing the broad spectrum of expertise and perspectives that have been brought together here this week. I know we're in for a real treat, and that we'll all leave more reinvigorated and ready to tackle the challenges of the next 50 years of conservation in the Arctic.

The main thing that I wanted to do today, on behalf of all of the employees of the Alaska Region and our regional director, Geoff Haskett, who isn't here today because he's recovering from knee surgery, and he was very unhappy to not to get to come, is first of all I would like to thank Jay Slack, Steve Chase, and all the employees of NCTC for helping put together this incredible symposium. I really think this is an incredible effort, and NCTC, thank you very much.

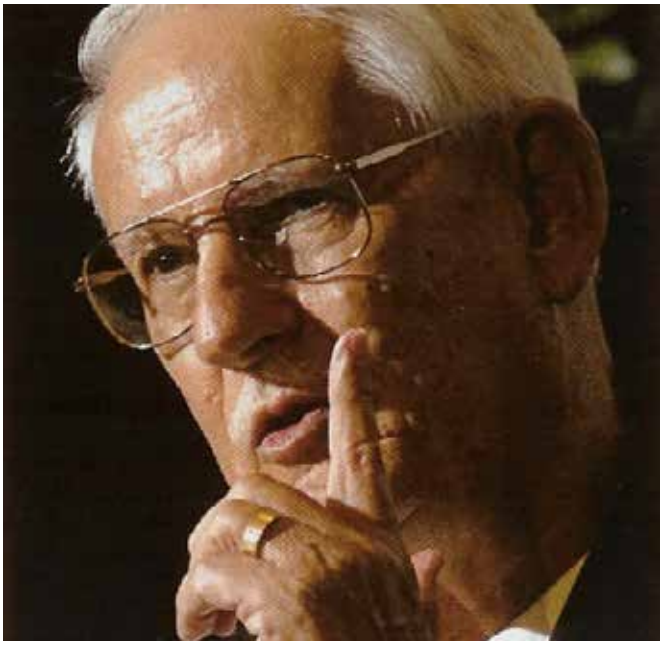
The other group that I would like to thank is all the people in the audience who have contributed to the conservation and protection of the Arctic Refuge over the last five decades. I think the combined contributions and studies and knowledge that have been developed by the people in the room today is amazing. Like Jay, I'm also especially pleased to see the young students who are joining us this week. I think that was a great part of the program, and I thank Jay for inviting them. It brings to mind the young scientists who accompanied the Muries on their expedition to the Sheenjek River Valley in 1956. On that trip, Olaus Murie told his young companions that one of the main objectives of the trip was for them to have a rich experience. I'm sure that the students who have joined us here this week will have a rich experience, and hopefully will be inspired by the conservation stories that they will hear to go write their own conservation chapter for the Arctic. There will probably be lots of ideas and schemes hatched here this week that hopefully will help us plot the next steps that we need to take to protect the Arctic. And I'd just like to say one last thing, and that is that those of us who are fortunate to work in Alaska and in the Arctic, we love showing people Alaska and we love showing people the Arctic Refuge. So, I'd just like a raise of hands who all has been to the Arctic Refuge… That's a lot. Okay, so for those of you who didn't raise your hand, look around, go talk to these folks who have been there; they'll all be glad to share their experiences and recommendations on the best float trips, the best hunting trips, the best hiking areas, and their favorite places. So, I encourage all of you to come visit if you haven't been to the refuge.

So with that, I thank everyone for helping put this symposium together, and I think we'll have a really good week and enjoy it.

Bob Krear

Sheenjek Expedition, 1956. Campsite on Last Lake, AK.

Lynn Greenwalt: "A Distant Treasure and the Message it Offers"



Former Fish and Wildlife Service Director Lynn Greenwalt

Well, here I am once again; ecstasy prevails!

When I looked out the window this morning, for a moment thought I saw the Brooks Range, but it was only the parking lot. I am inspired by that fleeting trick of my imagination to talk about the Arctic National Wildlife Refuge and my experience with it.

First, I should explain that I come to this particular challenge with a little confusion in my mind. Mark Madison is one of these people who can spring things quickly, and one day he asked me, "Would you come up and talk at our Arctic Symposium?" I'll do anything for Mark, especially when it's here at NCTC. But I had to wonder why it was they chose me. I'm not a very good biologist. I have never served in Alaska. I have seen the Arctic Refuge several times from Service airplanes, but why me? Then, the reason came to me: antiquity! It doesn't mean that I'm an antiquarian, which is a specialist of a very expensive kind; I'm not an antique. I'm just kind of creaky and have been around a long time. But I harbor a period of experience that goes back a very long way.

When Fred Seaton signed off on the original Arctic Refuge decision, I was preoccupied in a western part of Utah, where I had just been given the keys to the gate of a brand new refuge, i.e. 10,000 acres of desert salt marsh. It was—and still is—an incredible place called Fish Springs. It had several virtues, one of which was that the nearest neighbor was 28 miles away, it had no telephone, and no electricity. It was a delightful place to be with my bride, and the little people who come to married folks occasionally.

So it was that the two efforts began at about the same time. One was of minor moment, except for me, and the other was of extraordinary importance. At the time I was impressed with the idea of the Arctic Refuge—a large place, and remote. But I had a job to do, as others had a job to do, and I went about it never thinking that there would be a conjunction of my professional life with the evolution of this place and the events that came to pass as time wore on. I was involved in the evolution of ANILCA and its profound consequences, as well as many other acronymic activities that went on in those times.

Now the Arctic is unusual, and the refuge is extraordinary, as has been pointed out; it's almost as large as South Carolina. It is very remote. It is also the only refuge I can think of readily which has its own acronym, and I don't like that acronym. It is demeaning and more. There is another refuge that had such an acronym. It was called CMR: Charles M. Russell, in Montana, and it's a place that's placid now, fairly free of controversy, though it has gone through its periods of controversy about cattle grazing and that sort of thing. As far as I know, its acronym has fallen into disuse, for which I am grateful.

But "ANWR?" No! It is the Arctic National Wildlife Refuge. It's had far too many names along the way, and I don't wish it to become a four-letter word that could just as easily mean "American Natural Resources Winners" or something. Once in a while, we should say trippingly off the tongue, "Arctic National Wildlife Refuge." It bespeaks the national treasure that it is. Too many people know about the Arctic Refuge as ANWR, but ask them what ANWR is and they're likely to say it's that place somewhere up there in Alaska, and it has all that oil under it. A bad reputation; I don't like that. I urge you, every chance you get, to give the Arctic National Wildlife Refuge its full and proud name.

I was privileged to be a bystander when the Arctic National Wildlife Refuge began to be melded into the other activities that came out of a complex political debate about what to do with Alaska after statehood. One of the central questions was how things were going to be worked out with the Natives. It seems this country, for generations,

for a couple of centuries, has wondered, "What do we do with the Natives?" The Natives are wondering, still, and not just in Alaska, "What do we do with these people who want to do something with the Natives?"

All this activity was a manifestation of a desire to make Alaska whole, to be reasonably fair to the wide variety of Native peoples who lived there, and still move ahead with the things the nation wanted to do. There were some really fundamental and interesting approaches to this problem, as I'm sure you all know. Some of you may remember when it was said that Alaska's Native corporations, created by the complex legislation that was the Alaska Native Claims Settlement Act, would vie with General Motors and Ford as corporate giants in the world because of the natural resources available in Alaska.

I'm afraid that really hasn't happened; I'm afraid that dimension of the issue has not resolved itself in the way many people thought it might. Another part of the process was fascinating because men and women who preceded you in the Fish and Wildlife Service, not to mention the many, many conservation organizations who were pledging themselves to the progress of this idea of doing something with the National Interest Conservation Lands of Alaska, worked and struggled, and it was a mighty task.

It was a remarkable thing because all these contesting interests were trying to decide how to resolve the opportunity to make the most of this remarkable, pristine place, with these jewels, these magnificent resources, spread out across that vast land. It was a process tough on people. I got used to giving audience to young men and women who were working diligently on this, and having them break down in tears, "We just can't go on, this is more than we can bear." We didn't have a great many people in the Fish and Wildlife Service in those days, and those we did have worked hard. Some of them, I'm sure, were never the same again, literally, because of the tremendous pressure that was put on them.

The Ford Administration worked hard to develop a plan for Alaska and announced its details as a part of the election campaign. Mr. Carter won the election, and his administration advanced an enlarged alternative. Usually in matters of this kind, one gets only one bite of the apple, as the lawyers like to say. In this case, we all got a second bite, and made the most of it. It culminated in the event referred to this morning, when President Carter signed the final legislation. The world changed for the better for the conservation and the preservation of natural resources, at least in North America, and offered a model for the rest of the world to consider. There was celebration, let me tell you; I was one of the celebrants. I was delighted. I still am.

It's that culmination that we celebrate today, 50 years on. My little refuge in Utah was 50 years old a couple of years ago. Fish Springs is an example of what's happened in conservation over those intervening five decades. I went back there with my family for that golden anniversary and we found it quite unlike what it was in the beginning. The spring-fed marsh has been enlarged significantly, and a wide variety of wildlife has responded accordingly. Dikes had been constructed to overcome early-day attempts to drain the marsh and make better use of a relatively limited water supply. These kinds of things will never happen in the Arctic, because it was recognized and protected early enough to assure it would remain pristine. Fifty years of competent stewardship can accomplish a lot, and a visit to Fish Springs renews my conviction that there is a purpose in this noble trade we all undertook so long ago. I am certain that I did not do as much at Fish Springs, or in the evolution of the Arctic Nation Wildlife Refuge, and was far less influential than people are giving me credit for, but it's nice to hear those words, even if they are somewhat misdirected.

It's important that I talk, also, about another dimension of this that has been referred to earlier, and that is, "What do we do next?" Oh, I love history. Dr. Brinkley is one of my favorites, for I love to learn about what went on in the past. But there is also the future, and I can be very melodramatic about it and say, "Most of you have a whole lot more future than I have, but I got started earlier than you and it's okay."

What do we do in the future, because times have changed? It's changed for Fish Springs, in western Utah; it's changed for the Arctic. I have to say that one of the taglines in the motion picture trailer we saw says, "Free from human impact." I don't think there's anyplace on this planet that's free from human impact. When I was produced, in a manner of speaking, it was in the decade of the 1930s, 1931 to be precise. I was a statistic, which is comforting, since few people took much notice of an event that was very important to me: I was added to the inventory of people in the United States, a Constitutional obligation that embraced even me. In 1930, there were 123 million people in the United States; in the census year in which the Arctic Refuge was established, 1960, 189 million of us, an increase of 66 million. Just recently, the census revealed that 308 million of us are now in this country. That is a difference of 129 million in my lifetime—twice as many as when I was added to the roster. In 1790, when the first census was taken, there were 3 million 992 thousand people in the United States. There are more people stalled on Interstate 95 along the eastern coast of the United States at any given minute than there were in our entire country at that time.

These figures are interesting if you like that sort of thing, but I suggest these are freighted with far from trivial implications. It means that there are events going on in the world that affect the entire world, including the remote and grand Arctic National Wildlife Refuge, along with all other refuges in this magnificent system, of which the Arctic is only one of half a thousand or more.

When it becomes necessary to go into the far north with special mapping equipment—like the Department of Agriculture estimating the acreage of tobacco land—to look for sea ice in the Bering Sea with airplanes, it augurs poorly for the idea that maybe the Arctic area can

remain pristine in any real sense. The natural activities that go on there are very important to know about, but remember that they likely began as a result of human activity someplace. I've worried for a long time about how to deal with this dilemma of so many more people making demands upon the resources of this country, often in ways that are inconsistent with the values that we have applied when these refuge areas were set aside.

There is a bright side, I think, and something I'd like us to think about as we hear of the days of the beginning, the founding, the appreciation of a national treasure, the Arctic National Wildlife Refuge.

The Arctic National Wildlife Refuge is not the only treasure in the refuge system. There are over 500 of them, but the Arctic just happens to be the Koh-I-Noor Diamond compared to the lesser treasures, like my little Fish Springs, or Sheldon, where my father worked, or Wichita Mountains, or any of the rest of these refuges, even unto those that some of you may have as responsibilities. They're all treasures, and we must think of them as such; we must get other people to think of them as such.

There are ways to do that. Any of you who have ever been exposed to or have participated in the Joint Venture process in the upper Midwest will realize that there's nothing quite so formidable as a group of people who have bought in to that idea and that program. Preserving, protecting, and wisely maintaining wetlands and other similar habitats is a value to which they have committed their own lands, and have discovered that it is a source of great pleasure—it's fun. The secret is out: it's fun doing what we all did, what you do. The Joint Venture suggests to me that there are people who, when approached properly, are prepared to give a lot, including their time, their resources, and their great interest, to the pursuit of what things like the Arctic National Wildlife Refuge are all about.

I am transfixed with delight when I see something like Secretary Salazar's announcement just a few days ago of the remarkable proposal to preserve lands in the upper reaches of south Florida's wetlands and the grand marshes there. When you look at the list of people who are ready to embrace this idea, you will note that they are folks you wouldn't dare to put in the same room 10 years ago because it would have led to a bloody outcome, almost literally. It is something that delights me because it seems so obvious. The formation of the ACE Basin Refuge complexes has been a triumph of common purpose. They represent a mixing of resources that are not all Fish and Wildlife Service, but the wild creatures—and the people—which benefit don't care. The critters think it's great, I think it's great, and I know it is one of the concepts we must embrace with unequaled fervor as we press on.

It is a difficult thing to do largely because you're no longer dealing only with the critters, which was the point of our focus in the early years of this business. I learned a long time ago, I think it was from a maintenance man someplace, that managing wildlife is not the problem; it's the people that are hard to manage, and that's true. If you offer people alternatives that are limited or overly restrictive, they don't like you much. Change is a bad thing to offer to somebody, as you no doubt know. Change is terrible. It is particularly brutal because somebody has to go first; somebody has to take the first step. As I grow older and observe more and more, I begin to wonder if there's anybody around who's got fortitude enough take the first step in key issues. If you can make a case that convinces someone to take the initial step, I suggest you either turn around and run or step out of the way, because converts are impatient and move fast.

I remember running into a young lady in Charleston, South Carolina—that's the state that's a little bigger than the Arctic National Wildlife Refuge—and she had the unenviable task of introducing people to the idea of introducing red wolves into the southeast. She had an interesting philosophy: she said, "First, I get them to love the Fish and Wildlife Service and the people in it, then they love the wolves." That means somebody has to go out, talk to, interact with, drink coffee with, step first with other people who may not agree with your approach. You're into that kind of approach now because you must be. There are no real alternatives. I'm impressed with what is being done and applaud you for it.

There is another thing that I want to make abundantly clear that makes me feel very good about the future and this organization and its place in the scheme of things. It is a characteristic of this organization that has supported and buoyed me for many, many years. That element is the people in this magnificent organization. It is now so professional, so beautifully tuned that it beggars description. Suffice it to say that I have enjoyed the people of the outfit at first hand and consciously since I was about seven years old. My father was a refuge manager, and in due course I came to the conclusion that this quiet, competent, caring man had a very good job that he enjoyed. I came early to the conclusion that one should find work that is enjoyable, and this man had done that. I abandoned a lurking hankering to be a newspaper man, as he once was, and decided I would like a shot at this business of resource management.

In the early days, even during the time, 30 years and more ago, when I was Director, the role of the Fish and Wildlife Service employee was built upon the need to do as many different things as possible as well as we could. There was never any thought of anything as wildly imaginative as a "Friends " organization. We would have had a heck of a time getting Friends groups gathered together in those days, even if someone had been bright enough to think of it. There was no legal authority for such a thing, nobody had the time to develop it if there had been, and no one knew quite how, I am quite sure.

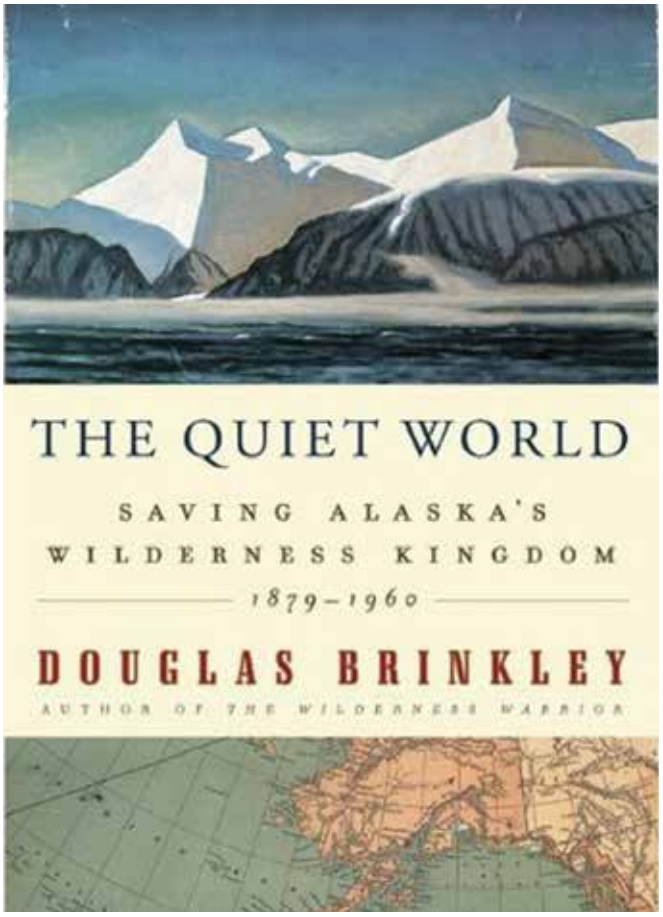
There was nothing like a public use specialist for any refuge. Public Use Specialist, what is that? Does he drive a bulldozer? Can he run a motor grader? Now, there are key people who do things never envisioned in my father's time. The Service is a different place now, I'm happy to say, and gives me increasing confidence that you are prepared to meet any challenge and do it well. You are wonderful. Those of you who work for the Fish and Wildlife Service have an idea of what the organization is like, and you might even have an idea of how proud I am to be an old guy who used to hang around the Service, long ago, and now looks at what's going on and is as proud as if I had a part in making it what it is. Even those of you who are students, new and eager, know by now that there is no better trade you can take up, there is no more appropriate and noble calling than this kind of work. It is fun, most of the time, but also has its moments when you have to rise to the occasion, which is good for you. You don't make a whole lot of money, but every person I know in this small band of travelers has admitted to himself, as I did, countless times, "I would pay money to these people to let me do this, if I had any money." Yours is a grand organization. It is not just the refuge part, either; it is the entire Fish and Wildlife Service, and everybody has a piece of the action and a role to play in that action.

Now, I'm not going to belabor anything anymore, because I cannot tell you anything startling about the Arctic National Wildlife Refuge. I have looked down upon it with great admiration, and the people with whom I was traveling were prescient enough not to put me on the ground in such a place, because I would almost instantly become a burden. I'm just that kind of person; I'm not fit to be loose, even with help, on a place like the Arctic National Wildlife Refuge. But boy, I can appreciate it from above, and I did many times.

Now I will leave you to more erudite and focused commentators, and in doing so I will say only that this symposium speaks to 50 years of a remarkable place. Many refuges are far older than 50 years, and there's one tiny one that I like very much because it has rich symbolism about it. That's the first one, over a hundred years old: Pelican Island. Pelican Island is a tiny place in a river on Florida's east coast. As the first refuge, it has been appropriately celebrated, and its visitor facilities include a singular and iconic symbol: a boardwalk, a very long boardwalk. On each board of the boardwalk is incised the name and the date of establishment of every National Wildlife Refuge in the system. One day somebody asked me to say what I thought about this boardwalk and all it implies. My only and deeply heartfelt reaction was, "It's too damned short, it ought to be running so far out into the surf you'd have to be a scuba diver to read the newest plank." You can do that; you are doing that. I am tired, I am old, I lack the ability but not the enthusiasm. You are young and capable and enthusiastic, with imagination and courage, and you can help put planks on the boardwalk at Pelican Island. One of them already represents a 19.3-million-acre piece of Alaska, but there is room for more like it.

All I can say is to repeat one of my most fervent wishes, which can never be fulfilled, unfortunately. I wish that my bride and I could start all over again and join you in doing the magnificent things you are doing. Thank you very much, ladies and gentlemen, for allowing me to be in your presence for a few minutes. I am honored to be among you again.

Dr. Douglas Brinkley: "The Quiet World: Saving Alaska's Wilderness Kingdom"



What I'm trying to do is I'm trying to write the whole history of the conservation movement in the United States. The first volume was *The Wilderness Warrior*, which dealt with Theodore Roosevelt and Pinchot and Muir, and how T.R. helped save 234 million acres of wild America. And now The Quiet World is volume two, and it is about saving Alaska's wilderness kingdom, not just the Arctic, which we're going to talk about in a second.

The idea of the second volume being so Alaska-focused really came out of writing on Theodore Roosevelt. T.R. never went to Alaska, but he was obsessed with it. And the big moment I saw for Roosevelt and people was when the word starting getting out. Wild Alaska had its first great promoter in John Muir. Muir in 1879 and 1880 went up and did wilderness journalism, as they called it, for the *San Francisco Bulletin*, and he wrote so beautifully about our glaciers. That book was not published—*Travels in Alaska*. It's the book you'll see everybody reading when they're on those cruises going up the Inside Passage. It's almost a book, you know, it's a modern library John Muir, and people are reading it. Well, that didn't get published until 1915, but in it is part of his travels to Alaska starting as early as 1879. Muir fell in love with Alaska, as you all know, and wrote, I still think, the best writing about the beauty of glaciers, and I begin my book *The Quiet World* about Muir going up there.

When you go to the Arctic Refuge, which I was lucky to do over the summer, just the quiet, that how much noise and clamor we have in civilization. Even working your way out here and just walking the little path from our lodges to here, you feel a sense of solitude and peace and quiet. And I don't think we can put a price tag on that. And Alaska is a place where we can find it, and particularly in the Arctic Refuge, which I'm going to talk about in a moment. But with that premise, those books were written about the need for wild spaces, the need to save treasured landscapes, but also animal protection and wildlife protection.

So Muir had those trips, and then there's a big event: E.H. Harriman takes the *George W. Elder*, his yacht, perfectly equipped, with a group of scientists, up to Alaska in the late 1890s as the Harriman Expedition. John Muir went on that, and John Burroughs, and Dr. C. Hart Merriam, and the great Native American photo portraitist George Curtis. It was a "who's-who" of the leading lights in the naturalist field, most of whom could also write well or could contribute, and they ended up developing the Harriman Reports, 13 volumes. T.R. wanted to go on that expedition, but he had just become governor of New York and couldn't, so he would simply get the volumes. But he was reading about Alaska, and when he was President of the United States he created both of the big national forests in Alaska, the Tongass and Chugach National Forests. We talk a lot about his wildlife refuges—he created 51 federal bird reservations from Pelican Island to far-flung Hawaii. But, I mean, look at these national forests alone T.R. did in Alaska, they're very significant. And no sooner did he do them and create huge big reserves like the Yukon Delta National Wildlife Refuge, he leaves off this in 1909. He could have won another term, T.R., but he decided not to run, and he goes to Africa to work for the Smithsonian Institution to do field collecting. He ends up writing two volumes with a naturalist named Heller, which they did on the game animals of Africa, a scientific two-volume reference work. He then wrote a more popular and gory African trails book, too. But he disappeared in Africa. His handpicked successor, William Howard Taft, said, "Well, T.R.'s gone." And Taft was getting this pressure from what you call today big oil, big coal, big timber, all the huge

companies and banks, because they thought Roosevelt was a crazy wilderness kook who had locked up all these wild places and things because he was so in this cult group.

But I will tell you that Theodore Roosevelt's vision of Alaska and of the West was he believed that wilderness was essential for democracy. There was a kind of a male, virile strain in his thinking, but there was this notion that if you had urban centers, you needed greenbelts, and you needed to be able to get lost in the wild, and that we could create a kind of wilderness democracy, unlike Europe. He found Europe to be quite a feat. He felt they shot out all their game. He had climbed the Matterhorn and saw no animals. So, he had a kind of vision of what U.S. Fish and Wildlife does, how to save all these endangered animals, how to have reserves, how to manage our natural resources, and he felt that Taft had betrayed Rooseveltian Conservation.

These followers of Roosevelt, they worship him. One is Charles Sheldon, who was famous with the Boone and Crockett Club and became an expert on the big game in the west, particularly mountain goats, mountain sheep, big horns. And he would go all over Alaska; he fell in love with Denali and wanted to save it as Denali National Park, and starting writing, journaling, coming back, lobbying, dedicating his life to the preservation of Mount McKinley. Roosevelt thought of Charles Sheldon as almost an adopted member of the family, they were that close. So I write the Mount McKinley story; I later deal with other characters at Mount McKinley like Ansel Adams when he goes with his son, Michael, whom I've interviewed. Michael Adams lives in Carmel Highlands in his father's old home, and he went up there in 1947 with Ansel. Ansel Adams was paid to take all these great photographs of wild Alaska, and some of them have become epic masterpieces like Mount McKinley at Wonder Lake. And the two main areas in Alaska that Adams focused on were the Denali Wilderness and the Glacier Bay. Virginia Wood helped create an Alaska Conservation Society, but mainly she was a prop pilot and promoted a lot of tourism. Just like Muir had predicted in his travels in Alaska, people were going to come to Alaska; there was another economic alternative to the extraction industries—tourism. And as the national parks caught, Alaska caught on, these became viable, and many of the people that helped save the Arctic Refuge were people working in the tourist industry or lodges—trail guides, hunt people, motel owners, restaurateurs—who saw tourism dollars for people. And the belief was that more and more people were going to come once Alaska became a state because it got a lot of press, "Come see wild Alaska."

Bring in other artists, not just Charles Sheldon, the other foot soldiers; T.R. dies in 1919, but he really connects with William Temple Hornaday, Wildlife Protection Movement. Hornaday writes a very important book, *Our Vanishing Wildlife*, and helps create the Campfire Club of America, which later takes a great interest in the saving of Lake Clark region and Bristol Bay in Alaska. But Hornaday and Roosevelt are working for congressional legislation to stop the slaughtering of northern fur seals on these islands of Alaska. They want seal protection laws, and so you're really seeing then Roosevelt putting his full throttle into things. You can't see it, but when you look at the book there's a picture, very small there, but it's Roosevelt holding gopher tortoises down in Florida where Paul Tritaik is with U.S. Biological Survey. He's holding them there when he went down to stay and he wrote an essay on gopher tortoises right before he died. He was very interested in the Galapagos stories of the tortoises of Darwin, and was trying to replicate studying it in wild Florida.

Another early lover of him was Ding Darling, who you have one of the lodges named after here. Ding Darling does so much with the duck stamp, on and on, all in the name of Rooseveltian Conservation. I write about a chapter in this book; the person who did this illustration on the cover is Rockwell Kent. Rockwell Kent in the 1920s went up with his son. He was a painter, did a lot of great work in Maine and Newfoundland and also Greenland that he was famous for. But he moved to a place called Fox Island, Alaska, a little island off of the Kenai Peninsula, and would paint the glaciers and do beautiful illustrations there. He wrote a book I highly recommend you just buy called *Wilderness*, and it is very much like a Thoreau, the Thoreau of Alaska; he's talking about the power of solitude, but he's there to bond with his son. And it's very, very powerful writing, and he illustrates it, and it's a very… an unsung classic in the genre that we're all interested in. Rockwell Kent famously illustrated *Moby Dick*. He also did the symbols for all the book companies you see: the symbol for Viking Press, for Random House, Modern Library, on and on. All those book logos he did, he's responsible for them. He was considered the great illustrator of his day. He later in Washington did a huge mural of Alaska in a post office that he painted. He was considered a Socialist during the McCarthy Era; he sent all of his papers, his principle papers, to the Soviet Union because he felt he was being purged in the Red Scare of the 1950s; a very interesting character, Rockwell Kent.

I get into the problems with Warren Harding coming to Alaska and dying. Harding was a foe of Rooseveltian Conservation, and his role was to turn it back. He wanted all public land, or as much as possible, opened up. If you ask me who's the worst environmental president, I would pick Harding. Remember Roosevelt dies in 1919, and Harding is president in 1920, and when Roosevelt created the Bull Moose Party, he divided the Republican Party, the Progressives with T.R., and then the Taft crowd. Well they now unify in '20, and it's the "big business" crowd winning. The Republican Party of today would very much like the Harding people, the same instincts of seeing land as a place to extract oil, extract copper, extract gold, almost zero conservation or land ethic. Harding goes to Alaska and dies in San Francisco. Either he was poisoned by shellfish or had a heart attack—there's a lot of debate. Robert Ferrell has a whole book on the theories of the death of Harding. But it was not a good period for conservation. Yet, a torch had been passed from T.R. to Aldo Leopold, who I know many of you here care a great deal about.

I'm just going to read for you very briefly a little letter that's a kind of… it's a collectible letter, really. Suddenly, T.R. writes this obscure man Aldo Leopold in New Mexico, and it's a direct link between the two of them that takes place. It's a simple letter, but here is Aldo Leopold in Albuquerque receiving, unsolicited, a letter, in basically his P.O. box, from Theodore Roosevelt, and he's there doing work with the Game Protection Association in Albuquerque. He writes—unsolicited, remember—"Dear Mr. Leopold, through you I wish to congratulate the Albuquerque Game Protection Association on what it is doing. I have just read *The Pinecone*." This is the newsletter called The Pinecone that Leopold was handing out. And Roosevelt writes, "I've just read *The Pinecone*, I think your platform is simply capital, and I earnestly hope that you will get the right type of game wardens. It seems to me that your association in New Mexico is setting the example to the whole country." That meant a lot to a young Leopold, to get a letter from Theodore Roosevelt telling him what he's doing on looking at game, how to properly manage game in New Mexico, and wilderness issues. You know, it was a big boost to Leopold, and of course he's a big character in this book. Leopold famously wrote, "I've never been to Alaska, but just because I haven't been there doesn't mean I don't want to make sure that we protect the Arctic, that I can't understand the beauty of the Brooks Range." And Leopold's influence is probably, after Roosevelt and Muir, I think, the most significant.

Now many of you are fanciers of Olaus and Mardy Murie, and I deal with them a great amount in the book because they are the great Alaska love story. Olaus Murie, if you don't know, worked for the Biological Survey and was an expert on caribou and the North Slope, and just an amazing writer. He would actually do the drawings on the field guides himself. He was one of the great conservationists in American history, a tour de force of a person, a great person. Olaus Murie and his wife Margaret, or Mardy, Murie, they went on a dogsled on their honeymoon, and as most of you here know, Olaus dies in '62, but Mardy Murie goes on all the way to meet Jimmy Carter and see this whole Arctic Refuge protected the way that it is today. She is the main thread story in the Arctic Protection Movement. Out front here when we have coffee, you can see the backpacks they had from their 1956 journey into the Arctic, and it's very moving, their whole story, and I write about it a great deal. Both were excellent writers.

I bring in other characters in this book, but in the 1930s and '40s, you're looking at F.D.R. a lot, and Harold Ickes, this irascible curmudgeon. Ickes was a Bullmooser, he worked for T.R., and even though he's a Pennsylvanian who ended up living and working in Chicago, was seen as a Chicago wheeler-dealer. Ickes got it, and is a major force of all of the wildlife movement through the New Deal Period. So, hard to imagine… And what's so neat about Franklin Roosevelt is he would bring in whomever. He let Ding Darling be the head of Biological Survey and do those experimental programs, create new refuges or come up with new, fresh ideas. The beauty of the Roosevelt years, of both Roosevelts, is that they weren't afraid to bring in talented specialists and let them do their stuff, really great American work. It would have been impossible to have two better conservation presidents than T.R. and F.D.R. Truman was not very good, and you get into the Eisenhower years and you get, in dealing with Alaska particularly, a kind of fallow period.

And yet by the 50s, you start getting Alaska seen as a kind of a sacred place for wilderness seekers. I mentioned in the '40s people like Ansel Adams, but also Bernard DeVoto started a great column, and conservationists started championing it. And by the 1950s, you started having the Beat Generation movement coming to fruition. Now I'm not sure it was really a movement, but what was happening is a lot of people were starting to take ecology seriously. A lot of this happened from the scare of fallout from Hiroshima and Nagasaki. I write in my book a chapter about a Fish and Wildlife guy, Sea Otter Jones. I don't know if any of you heard of him, but Sea Otter Jones was based out on the Aleutians. He served in the U.S. government in World War II against the Japanese attacks on the Aleutians, stayed on the government payroll and became a fierce anti-nuclear activist, and it made him sick to see nuclear bombs dropped on the Aleutian chain. Nevertheless, he went on to protect the sea otters and bird life of that Alaska Maritime National Wildlife Refuge, a spectacular place with the headquarters based in Homer. But the Aleutian chain is like nothing else, and we're so lucky that we have that as a resource in our country, and men like Sea Otter Jones. I always try to profile an on-the-ground person that's really doing the work, and so it comes keenly into focus.

Gary Snyder, the poet, was very important with his building off of Robinson Jeffers. Robinson Jeffers' poetry—if you haven't read it, read it—he was an anti-modernist in many ways. He talked about inhumanism, but he started looking at a holistic way to look at the earth and the cosmos. He lived famously in Carmel in his Tor House and Hawk Tower built of stone, and his poetry only grows in stature via people like you who care about the planet and our resources, and have a love of nature. Robinson Jeffers is just profound, and he influenced people like Gary Snyder, who started writing in the 1950s after being a lookout in the North Cascades.

Reed College became a beehive in Oregon for some of these poets and philosophers and writers. Jack Kerouac put on the rucksack and famously wrote *The Dharma Bums* about getting out and hiking and backpacking, and about the Sierras and Cascades. I even write in here about the Beat poet Allen Ginsberg, who hated the Arctic. He went with the Merchant Marines up there and was writing about the desolation he was feeling going up there. But it was… poems were written by Allen Ginsberg from the Arctic, and it became part of it. The town of Homer had a group of people called "Barefooters" that came up from California that wanted to live barefoot and have a communal society. Brother Isaiah became their big community leader in Homer, and this was pre-Haight-Ashbury '60s. There were people

that were seekers for land, to eat of the land, to eat seaweed, to live an alternative life, who were coming up there. So, we talk about Alaska today, you hear a lot in the news about the "right-wingers" in Alaska, or the "Palinites", and all the extraction industry and the oil. But there're also a lot of artists and philosophers and intellectuals, misanthropic-types, footloose and fancy-free types, and professional drifters that are in Alaska, too. And you really see this with Rockwell Kent when he came. He was a hero to the Beats, but by the late 1950s and '60s, Alaska was like the end of the line, the end of the road. If you go to the Homer Spit, they even call it the end of the road. So the Beats used to say, "You hit San Francisco (like in Kerouac's *On the Road*) at the end of the American road." Well, then, time out now, the end of the road is Homer Spit if you start bringing Alaska into the equation. Remember Alaska's statehood in the late '50s, and Dwight Eisenhower bringing Hawaii and Alaska into the states. I'm going to talk about that in a second.

Another important person in my book is Walt Disney. Disney made these documentaries of *White Wilderness*, and it made people start… well, it's good and bad. William O'Douglas, who I am going to talk about, disliked Walt Disney's "nature faking." Lois Crisler wrote a book called *Arctic Wild* and Disney filmed, but they would do things like steal wolf cubs and then domesticate them. And there would be pictures of the Crislers, Herb and Lois, with little wolves kissing them on their faces, and they'd let them out and they'd come back like dogs. And so for many of you today, you know with a wild animal, that's not a proper way to deal with it. However, you've got to give them a lot of leeway because wolves were just being shot. Olaus Murie, I write a chapter on, at McKinley was trying to protect them, but the mindset of wolves as being nothing but worthless predators and vermin was very deeply rooted in the west, and, particularly in Alaska, "The only good wolf is a dead wolf." So by humanizing them in Lois Crisler and in Walt Disney's film, all of a sudden you had kids say, "Oh my gosh, the wolf's so cute," you know, "I want a wolf stuffed toy" and "Polar bears are so cute." And Disney helped get mainstream people thinking about not just the Arctic as being an invaluable ecosystem, but also a desert on some of the documentaries with Walt Disney's *True Life Adventures*.

Disney made the insignia for the Alaska Command Post during World War II with the seal on it, and, for Disney, seals had all of the great characteristics of a cartoon animal. You can imagine why he liked seals if you're in his business. And he got deeply interested in seal protection, Disney, and fought for it in the '50s, and he made a movie called *Seal Rock*. And it's really interesting—he sends a crew out to the Pribilofs to film the seal colony there, and they also show native people and what life was like there. Disney sent them a cable when he received the film: "More seals, no humans." And when they kept having humans in it, he said, "I don't want any, I want the whole documentary of seal." He could not get RKO or anybody to distribute his film on Seal Rock because there was just classical music, watching seals play, and they'd have kind of an invented narrative, you've seen the mother with her pup kind of thing. So Disney went to Pasadena and bought a movie house, rented it himself, with no people coming, but just had it play, because if it played for one week in a movie house, that qualified for an Academy Award in the new category they called "shorts." You can win an Academy Award for a short documentary. So he ran the "short," said it had public viewing because he bought it, and it won an Academy Award. And then Disney took that, and it changed the way the movie industry thought, "Wow, documentaries of a National Geographic-type or IMAX." We have IMAX coming out on the Arctic. There is an audience for those, and Disney helped pioneer that in a very real way. He was a Republican, he voted for Goldwater in '64, he was a very big Eisenhower person, but in his personal correspondence he showed a great love for the coyotes that lived in his backyard, he liked watching squirrels. So he had affection for wildlife, and he did some good and important work in conservation even though it wasn't the main thread of his life.

Talking with Roger Kaye here, who is the expert on the Arctic Refuge, is humbling. His book on the wilderness in the Arctic is just superb, and it was invaluable to me. I hope you all know Roger—I'm sure most of you do—and read his book on our last great wilderness. But the Arctic movement has many pieces in it to people who save it: the Muries, first and foremost, I would say, their constant lobbying for the Arctic Refuge in the '50s. And there are other characters: I mentioned Ginny Wood, Virginia Wood, and the Alaska Conservation Society, Grassroots people, Alaskans fighting for the Arctic, William O. Douglas, the great Supreme Court Justice.

I want you all, if I can tell you to do anything from when I step off of here, to really start paying attention to the writings of William O. Douglas. This is one of the great giants in American history, but he's been maligned, and we've got to bring him back to his proper place. What Douglas did for the wilderness movement is extraordinary. He's a lynchpin between the T.R. conservationists and the Roosevelts, but he was a torch carrier for the hard years of the '40s, the '50s, and into the 1960s for wilderness. And here is a Supreme Court Justice going up with the Muries in the 1956 expedition, funded in part or almost entirely by the New York Conservation Society, taking the time to go to the Brooks Range and hike and camp. It is not an accident that William O. Douglas's book *My Wilderness* comes out in 1960 by Doubleday, the same year the Arctic Refuge was saved. Douglas's first chapter is about his trip to the Arctic and he writes about the Brooks Range, and does it in a very eloquent fashion. And his power in Washington was just immense at the Supreme Court, and what Douglas does as a wilderness fighter is unbelievable in his life. He would walk the walk, literally, walk 186 miles to save the C&O Canal, walk to save the Olympic coastline in Washington, walk all over Oregon and California to save places. Take the Sierra Club position to stop Disney from building the Mineral King Resort next to Sequoia National Park: very radical and prescient in the way he was using law to protect, to give trees standing, to give

animals rights. I mean this guy was unreal, Justice Douglas. The problem that he's had is his biographers have tended to be lawyers that are looking just at this from kind of a very narrow, legal law school. They go, "Oh yeah, he used to hike a lot. Oh yeah, and he was in that wilderness group." So I write a lot about the Wilderness Society in this book. Wilderness Society to me is just when… Aldo Leopold is a cofounder of it, but they were able to recruit Douglas to do all sorts of events with them, and the Muries became friends with William O. Douglas. We shouldn't forget him. We need to have a picture of him here because this is his tribe at the U.S. Fish and Wildlife. They're not honoring him at other places except Yakima, and I think we've got to put him into the narrative and talk about him a little more, because he had a lot of wisdom for us.

But Eisenhower was not a conservationist with a capital "C." His first Secretary of Interior was awful. Douglas "Giveaway" McKay, they used to call him, a car dealer from the Pacific Northwest who had zero interest in a conservation legacy. He wanted to open up public lands. He was a businessman's businessman. But he got into some legal hassles, health troubles. And the second Interior Secretary, Fred Seaton, a moderate Republican from a newspaper family in Nebraska, did a very fine job on behalf of conservation. Because he owned newspapers, the owner of the *Fairbanks Daily Minor* was close, the family was close to Fred Seaton, which helped because the *Fairbanks Daily Minor* was in favor of the Arctic Refuge in the 1950s as a kind of trade-off for opening up other lands for coal and drilling. A lot of this is "quid pro quo" stuff going on in Alaska. Same old story, you know, you've got to give to get a little, all these deals going on. If you don't have time for it you can read my book or read Roger Kaye's book covering some of that. But Seaton did a good job as Interior because he listened, and I think the guy that he listened to the most was Sigurd Olson of Minnesota, best known for helping to save the Boundary Waters there. A great writer, he wrote in the 1950s *The Singing Wilderness*. A real gentleman, somebody Seaton loved to talk to and see. He was sort of his favorite naturalist, conservationist—if you'd like, he was Seaton's favorite "lefty." And they had a great friendship and rapport, and he didn't go too fast, but Olson kept pushing for the Arctic Refuge in a very appropriate and political way with Seaton to get behind it.

As you all know, December 6, 1960 is the big day, and Eisenhower makes the announcement. I write here about Olaus and Mardy Murie getting the wire. They're at Moose, Wyoming, in the Tetons, and they can't believe it's finally coming to fruition. It was a lot of scary fights on the way to saving the Arctic Refuge. I write in the book about Operation Chariot, the notion of Edward Teller and the Atomic Energy Commission wanting to drop a nuclear bomb on the Arctic to create an oil port. This was not just a rumor, this was a plan that was gaining momentum, almost happened. That galvanized a lot of people in Alaska to stop Operation Chariot. Nobody wants a nuclear bomb dropped in their backyard. But it was real, and there're some good books on that topic. I write about it here also. So there were a lot of things conspiring to make it work for Ike to green light it. But I want to say something positive about Eisenhower: he did sign the treaty for Antarctica, and push through for other countries to demilitarize it. Much of Antarctic preservation of today has to do with Eisenhower's policy on Antarctica; it was sane, good global policy that Eisenhower pushed with Antarctica. It's flawed, and I won't get into that now, but nevertheless, it's an achievement. And then Eisenhower signed the Arctic Refuge. Roger Kaye and I have both been flustered, looking for the "Golden Document." Why did Eisenhower do this? I talked to David Eisenhower and Susan Eisenhower, and they think Ike had more of a love for the land of America, was more of a conservationist than the written record shows. But Ike wasn't that great of a writer, didn't keep those kinds of notes. But he did it, it got done, and it meant trade-offs for other lands, but the Arctic Refuge came in 1960, and, as you all know, it really wasn't as controversial, there was fear it would go down. Last night at my book launch party, Ted Stevens' widow was there, and Ted Stevens was the lawyer on behalf of creating the Arctic Refuge in 1960. He later spent his career opposing, wanting to open it. So the big deal in the late '50s was statehood, not the Arctic Refuge or other wildlife refuges.

I'll end by saying it's a perfect ending when Eisenhower announced it December 6th, because that same day Douglas is writing a book called *Muir in the Mountains*. Here's a Supreme Court Justice writing a children's book on John Muir, because he wanted all young people to understand Muir. So, imagine you're in Washington, with a Supreme Court Justice writing a children's book on John Muir, the Arctic Refuge just created, and that very day Kennedy picks Stewart Udall as his Interior Secretary. And Kennedy had signed, along with Hubert Humphrey, was sponsoring wilderness legislation. The wilderness movement was really galvanizing there in the 50s, the Wilderness Society people. And so by the time you get that moment, when my book ends in '61, we're having a week, you know, 50th Anniversary. Kennedy Inaugural, Robert Frost, the nature poet, comes to the podium because Udall picks him, loves his New England woods poetry. You've got, I think, the best Secretary of Interior in American history, Stewart Udall, coming in with a real understanding of western lands, and he gets it, gets the conservation movement. Kennedy, who is a playboy, cigar smoking, his attraction places are women—even when he goes to a glacier, he's looking at the women that are working there—he never, didn't sponsor all of this conservation stuff, Kennedy. He wouldn't give it… it was not… He's important, I mean, the Wilderness Act, Lyndon Johnson gets all of this credit, but it was Kennedy Administration guys that pushed it through. And it's Kennedy who was trying to get a little of the Roosevelt magic in conservation; it's Kennedy who wrote the introduction to Stewart Udall's *The Quiet Crisis*; it's Kennedy who put the power of the presidency into defending Rachel Carson's *Silent Spring*. It's Kennedy who creates national seashores, as I mentioned, particularly in his own backyard, Cape Cod, one of the really great ones. It's Kennedy who allows, working for Udall, people

like Wallace Stegner, Peter Matthiessen, writers and poets. And so, I've never been a believer in the "New Frontier" and "Camelot," but in my new book I'm working on, it's quite remarkable. And right before he was shot, John Kennedy went all over the west on a conservation tour to our national parks with Stewart Udall, and was giving conservation speech after conservation speech. Udall, again, didn't think his heart was in it enough at the time, but, nevertheless, there it is, he was doing it. So, you don't have the Wilderness Act without the Kennedy crowd embracing the wilderness movement the way they did, so we need to bring Kennedy into the narrative.

And we all know Bobby Kennedy loved the outdoors and climbing, and we know that story. Bobby Kennedy's great hiking buddy was William O. Douglas, and they went all over together, even to Siberia together, Bobby Kennedy and William O. Douglas. And I'm going to end with a story on that in a second. Well, let me quickly just tell you, when they went together, Douglas was such a tight, tight outdoorsman that Bobby got a fever of 104 in a forlorn Siberian village, and he put on his rucksack, Douglas, and said, "Well, this is where we part company Bobby, good luck!" and left him there. Ethel Kennedy, who I interviewed for this book, told me how she was furious that Douglas did it, but Bobby understood. It was sort of Darwinian theory, you know, "I'm strong, goodbye." But Douglas was beloved by the Kennedy family; he was an honorary member. Ethel, even today, talks fondly. Bobby and Ethel went on one of his hikes in the Olympics, and she said it was a rainforest and it deserved to be called a rainforest—all it did was rain. And Douglas went for a week, and they thought it was going to be exciting, but Douglas set up a hike that's different than it. Ethel told me he had his newest wife, and he brought her this beautifully gift-wrapped package, and they thought it was going to be a diamond necklace. And the big deal was at the campfire in three days he was going to give it to her as an anniversary gift. So when they had time to kill on the trail they were all debating what Douglas got because he kept saying, "This is the greatest gift a man can give a woman." And Ethel scoffed, "He got our attention, what is this great gift?" And finally they opened it and it was his used ax, his family ax, that he gave her! And Ethel said, "I went to Bobby and I said I'm getting off the trail, Bill's crazy, I want out of this hike." And she cut her hike a few days short.

But the point is the Kennedys and Douglas and all there with Udall, they were all in the mix. And of course Bobby Kennedy, Jr., who comes here quite a bit, as you all know, is so committed. The family's been very committed to it, as was Lady Bird Johnson, and I'm writing about them coming up.

Finally, I just wanted to say I end the book with a quote I'd like to read you, and it's this… the power of John Muir really continues and by the early '60s, Muir is really in vogue. David Brower, you know, the 1960s is the year of *This Is the American Earth*, Ansel Adams and Nancy Newhall's book, and getting the Sierra Club large format books. But here is that very year, 1960, when Douglas, writing about John Muir, writes, "Knowing the people's love of beauty and their great need for it, Muir gave his life to help them discover beauty in the earth around them and to arouse their desire to protect. The machine, Muir knew, could easily level the woods and make the land desolate. Human kind's mission on Earth is not to destroy, it is to protect and conserve all living things. There's a place for trees and flowers and birds as well as for people. Never should we try to crowd them out of the universe."

I think we are in the age of global warming, climate change. Science is doing such an incredible job trying to bring species back, and wildlife biology has become professionalized so much. However, we seem to not be getting the word out about treasured landscapes, the great American outdoors that Salazar talks about. It is hard to bring these land issues in. I think it is because the environmental movement has been boiled down to global warming.

So the more IMAX films, the more National Geographic, the more Explorers books, the more photography, the more we work with the general public and really get the word out, the more we work in schools to get young people engaged in urban wilderness, to get them planting and learning about trees and the outdoors, nothing can be more important than getting young people engaged in nature. In earlier generations, they all knew the outdoors because we just heard how the populations increase and you had to know the outdoors to live—it was part of your life. But now we are closing ourselves from the natural world more and more, and I find that part very frightening. But there are great champions of the Arctic: Tom Campion with the Alaska Wilderness League has been doing great work, Bill Meadows of The Wilderness, and The Sierra Club.

But it seems like a movement in transition, and people who care are not quite sure where to go. We do not have a William O. Douglas or a Theodore Roosevelt government. We do not have those kinds of leaders that are putting this as a national issue. I find it important to remind ourselves of our ancestors and what they did, and make it a career; you can be tomorrow's Olaus and Mardy Murie.

I get worried with the economy. If we have a depression and we do not manufacture things here anymore, people are going to want to do "land grabs" for natural resources in public lands to make money in communities. And it's hard to tell people that are broke, "No." But that is what Roosevelt did; he said no to mining the Grand Canyon for zinc and asbestos. He said no to building a railroad segregating Yellowstone. We have got to say no to Shell Oil trying to drill off the coast of the Arctic Refuge right now. It would be sacrilegious; it is a molestation to allow offshore drilling right off of the Beaufort Sea, right off the Arctic Refuge. So we have got to get fiery about it and try to stop Shell from doing that this spring. That would be a big victory for this generation.

Thomas Strickland:

Thomas Strickland, Assistant Secretary for Fish and Wildlife and Parks

It is a happy occasion to think that fifty years ago a Republican president, President Eisenhower, would take the action necessary to create this refuge. We all stand on the backs of other champions and heroes over many decades, and certainly those of us who are in the conservation cause are acutely aware of that. But there are moments in time that, if that moment is seized, things of great consequence for all time can take place, and sometimes those moments are there and they are not seized. But the ones that were seized back in 1960, when this refuge was created, and then 20 years later when ANILCA, with the leadership of President Carter, was passed, those are moments that will resonate forever, and the planet will be a much better place because those moments were seized.

We had other moments going back in time to the Civil War, when President Lincoln found time during the Civil War to sign the Yosemite Grant, which for the first time protected a unique and beautiful place, the Yosemite Valley in California. Eight years later, of course, the great general of the Civil War, Ulysses Grant, signed the act that established Yellowstone as the first national park in 1872. In 1903, President Theodore Roosevelt signed an executive order to create the first wildlife refuge, of course Pelican Island in Florida. In 1933 President Franklin Roosevelt established the Civilian Conservation Corp that not only employed hundreds of thousands, actually millions of young men in that time, but also planted nearly 3 billion trees to help reforest America, and constructed more than 800 local and state and some federal parks nationwide, and really exposed a whole generation of Americans to the beauty of the outdoors.

In 1960, fifty years ago, President Eisenhower, with Secretary of Interior Fred Seaton, signed a public land order establishing the 9 million-acre Arctic National Wildlife Range, that was later expanded to 19.6 millions acres, and then renamed the Arctic National Wildlife Refuge when President Carter signed ANILCA in 1980.

Because of its vast size and remoteness, the refuge has an extraordinary diversity of ecosystems and wildlife across five different ecological zones. Unlike Yosemite or Yellowstone, relatively few Americans will ever visit the Arctic Wildlife Refuge. So the value cannot be in the numbers that go and actually set foot on that refuge; the values are more transcendent. To set it aside is to recognize that there are values in protecting places that are untouched by humankind. Places that exist in the normal cycle of nature where the primordial forces, the rhythm of the seasons, the migration of the caribou, the ducks, geese, the shorebirds, the gulls, and the terns have continued unaffected by humankind through centuries and millennia. There are native peoples that have had a harmonious relationship with that landscape and the wildlife over many centuries. So those values are broadly supported by the people of this country, notwithstanding the fact that they are not going to be able to put their feet on the ground up there for the most part. America strongly supports our efforts to conserve and protect this vast region.

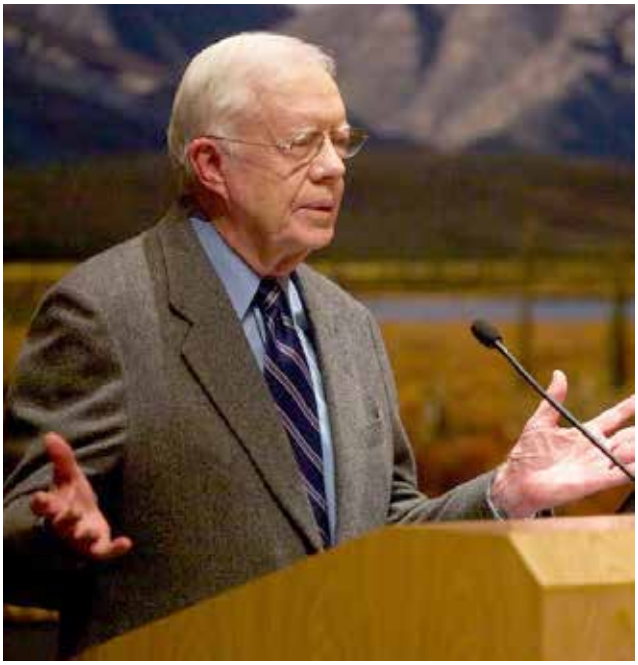
I want to make it clear, it was made clear during the presidential campaign, it was made clear during Secretary Salazar's confirmation hearing, and it was made clear during my conservation hearing: on this administration's watch there will be no oil and gas development on the Arctic Wildlife Refuge.

The Arctic has a complex climate, characterized by little sunlight in the winter, long summer days, strong winds, low temperatures, and little rainfall. There is very little moisture in the Arctic, as you know, and so, as thawing occurs, that moisture goes down into what was the permafrost, and it becomes more of a dry desert, as opposed to a more frozen or lush desert, as anomalous as that sounds. One of the most important steps that I have taken as Assistant Secretary is to sign the order that set aside the largest designation of critical habitat in the history of this country. That was with respect to protecting the polar bear, which has been listed in the last several years as a threatened species, and we had to make a decision of what to do to protect critical habitat. That order protects 187,000 square miles of habitat, much of it is sea ice that in the winter is frozen, but as we all know that ice is retreating further and further in the winter or in the summer, and taking longer to freeze back. That is creating a hardship on the polar bears, which have to use the ice flows in order to do their hunting for the seals. So it is the long-term threat to the polar bear from climate change that led us to list the species, which led us to designate that critical habitat. We have a number of strategies underway to try and manage the population, but at the end of the day, until we address the core cause of the impact on that habitat, which is the climate change, we'll be fighting that kind of rear guard action. The threats posed by climate change across our ecosystems, both to humans and to living things, all living things, are profound, and everybody in this room knows it and lives it.

Lowell Sumner

Dall sheep, Arctic Alaska

President Jimmy Carter: "Reflections on Arctic National Wildlife Refuge"



USFWS/Ryan Hagerty

Former President Jimmy Carter

In 1976, when I was elected to the presidency, Morris Udall was one of my most tenacious opponents. He was one of my nine or ten fellow candidates for President that never backed down. He never won a primary, and I won most of them. So we were still friends, and when I got to finally prevail in November of 1976, Morris Udall immediately contacted me about the possibility of doing something about Alaska lands. Many of you may remember Eisenhower was president when Alaska became a state. And 20 years later, when I became president, nothing had been done about Alaska lands because it was so highly controversial. It was a constant struggle between people who wanted a small amount of wilderness area, some national parks, and a lot of state parks, land to go to the Natives, land to be set aside for hunting and fishing, land to be preserved, land to be made into forestry areas, and also some to go to the state for management on its own. And it was a deadlock, and nobody knew how to answer this most important question: "What are we going to do about the Alaska lands?" There was no solution for 20 years, primarily because of the complexity of the question, but also because of senatorial courtesy. Senator Ted Stevens and Mike Gravel and the only Congressman they had from Alaska were able to block any action. And I had a very strong majority in the House of Representatives among Democrats. We passed it without any trouble with Morris Udall's help, but when it got to the Senate there was no way to make any progress. And it was deadlocked because nobody wanted to violate the right of two senators from a state saying, "We don't want this to be done." So it was held up.

The Antiquities Act of 1906 had been designed in those ancient days just to let a President and a Secretary of Interior, a President of course, pick out a particular site. They were called monuments. So we began to identify in Alaska the precious places we wanted to preserve. I declared individually that they were National Monuments, seventeen of them, and the cumulative size of them was 67 million acres, about the same size as the state of Minnesota, to put it in perspective. Ted Stevens threatened to go to the Supreme Court, which he did. He got the oil and gas companies to go to the Supreme Court, they all collected to try to show that what I was doing with the monuments designation was unconstitutional. To make a long story short, the Supreme Court ruled in my favor. But it was because of that ability that I had under the Antiquities Act of 1906, to designate any place I wanted in Alaska as a national monument and preserve it, that Ted Stevens began to negotiate with me.

On the 2nd of December, 1980, I was able to sign ANILCA. The Senate had passed it 78 to 14; Stevens and Mike Gravel both voted against it. And it was 106 million acres in conservation, which is just 3 million acres larger than the state of California. We gave 44 million acres to the Alaska Natives for their use and 100 million acres to the state of Alaska.

We set aside 95% of Alaska coastal region for oil exploration, and we were confident that the refuge would be safe forever because the law required that a President would have to approve it and both houses of the Congress would have to approve. We never dreamed that three bodies like that, the White House, the Senate, and the Congress, would all make that horrible mistake. But it only took a few weeks after Reagan became president that he appointed James Watt to be his despicable Secretary of Interior, and they began then to make a move to open up ANWR for oil drilling. This has been going now constantly since I left the White House, having a Republican administration in Washington, both of the Bushes and as well as Reagan, that there are new moves to open up for oil exploration and oil drilling. So far we

haven't been able to get a Democratic administration to protect it firmly. We just have to remain vigilant. Right after President Reagan became President he changed the Automobile Efficiency Standards and decreased it by 1.5 miles per gallon. That cost more and wasted more oil than the desecration of a coastal plain on a wildlife refuge in all of its reserves. We wasted more oil with 1.5 miles per gallon efficiency on automobiles than all the ANWR could ever produce. In fact, if we just drained it dry of oil and desecrated those lands, it would only serve America's needs for about six months.

Well, there were dire predictions by Senators, Congressmen, Chambers of Commerce, and individual communities that passed resolutions condemning me, and pointing out that what we had done by setting aside all this territory would be a catastrophe for Alaska. Since then, Alaska's population has increased 70%, park visits were up at that time 350%, and tourism had tripled, exceeding in value to Alaska timber or fisheries. In 1996, Alaska was number one among all 50 states in education, in high school completion, in household income, and had the lowest death rate in America. Many of the communities whose Chambers of Commerce had condemned me now are calling upon some of the parks to be even expanded further.

But decisions about Alaska lands are not over. Some progress is being made to carry out some of the provisions of ANILCA. It requires the Secretary of Interior to complete a survey to recommend to Congress what additional lands in Alaska should be given wilderness status—perhaps as much as 100 million acres. We need to keep roads out of Tongass National Forest. We need to consider BLM land for wilderness status. And we need to define very narrowly the subsistence activities that would be permitted to Natives Americans and Indians, Eskimos and Indians, within the precious areas. Those things have not yet been done now, so far as I know.

Rex Gary Schmidt

Typical scene in the upland tundra area, as seen from the Grumman Goose, Fish and Wildlife Service plane, during 1951 waterfowl survey.

Dr. Amy Vedder: "Global Perspectives on the Arctic Refuge"

Let me start first with one of the things that I found striking as I learned the history of the formation of the Arctic Refuge. The creation, the protection of this special place was that back in the '40s and '50s, a lot of the thinking going into this new place was underpinned by ecological concepts. But when you think about the '50s, ecology was still a very little known body of thought. It was still in formation, people were still trying to figure out what it really meant and how to study it. And yet this band of people who came together thinking about how to protect these lands were biologists, and they were actually doing a tremendous amount of early ecological work, they were thinking in a new and different ecological way. And whether it was Bob Marshall and Sig Olson, Olaus Murie, Lowell Sumner, Starker Leopold, or Frank Darling, they were just discovering the implications of the science that they were exercising. They did a number of surveys, and those biological surveys were documenting all sorts of life, and processes in those lives, and relationships between species. Whether it was some of Marshall's early work in the 1920s, or some of the biological surveys of Lowell Sumner and Collins and others culminating in the 1956 Sheenjek Expedition that George and Bob were on, organized by the Muries, these were biologists trying to figure how these systems worked, and they were looking at systems, they were looking at ecology.

Well, what they were seeing were these migrations, caribou becoming the poster child for protection of the Arctic. It was these migrations that led them to vast scales being documented; they also recognized that these were ways of looking at a scale that would allow for many other types of life to persist.

So they were beginning early on this concept of landscape scale, huge immense areas necessary, big enough for wildlife of all kinds to persist, to be sustained. And not just life, not just pockets of species, but their movements, their life, their life patterns, their life processes. It was the grand phenomenon of migration that was, in part, what they were trying to protect. And that became very, very important as one looked at the scale of protection necessary, whether it was the first 9 million acres that were set aside as the wildlife range, and then, importantly, becoming the 19.2 million acres, and even going beyond and working on transboundary cooperation with Canada. So this biology, this ecology was really important.

There were strong programs of predator control throughout this country, and certainly that was being played out in Alaska. In this wild, wonderful world, wolves were being decimated. So, to be able to step forward and say these full systems of life are important, that even these predators who we consider inconvenient are vermin, are scourged, actually are important, play important roles in these systems, and also have value and rights in these systems.

So that was really the beginnings of people looking at how to conserve these full ecological systems, and it led to the proposals for protecting the Arctic, full sets of habitats, the five ecological zones we all have heard about from top to bottom, recognizing the value of all species, the small and the large. This is the forerunner of what we are now calling landscape ecology. This is now a new science that's being called landscape ecology, still in its formation, still trying to figure how to provide us the kind of wisdom necessary for doing long-term, truly sustainable conservation.

We also have continued to develop the science of landscape ecology, and one of the emerging ideas is that we should be looking at species that range widely or need large areas like the caribou in the Arctic.

So, back to the Arctic; these folks, these founders, these inspired leaders in conservation were people who were really ahead of their time, and protection of the Arctic on that basis, on the scientific basis, was very much ahead of its time. The idea that not only would those pieces be protected, that ecological processes could play out. These people as scientists were also talking about evolutionary processes being played out, and that gives us so much more to dream about and aspire to. And I think it's that kind of thinking, as I was being trained, as I learned about some of these areas as an ecologist, that inspired me to apply those kinds of concepts where I would work later in my life.

So, it brings me to a second point of these three; the founders are scientists, they're ecologists, they've built on this sound base of information. But they went beyond that and they combined that ecological sense of a whole with a deep, deep personal, individual, communal appreciation for nature, and the intangible values, the beauty, the wonder, the peace, the awe, the adventure of these places. So here were scientists who one would normally consider objective, fact-based, control-oriented folks going so far beyond the traditions of science and allowing their hearts to speak as well as their minds. And that combination created in this country what emerged as this wilderness ethic.

Now, the third aspect I wanted to highlight about that last decade as the Arctic was becoming protected is that one thing I find striking is that the people involved recognized very early that people must be part of this. The problem is not biology, it's not conservation; it's people. Flip that around, the real solution is people, and I think we all recognize that. But to have this group, again scientists, who were transcendentalists, who also recognized the importance of political relationships and power, and the voice of the people, I think, was extraordinary for the 1950s. They knew they needed a coalition, they knew they needed many other voices, more than just their own. And I think that is outstanding. And it led them to say it's not just people who look like us and think like us and have some of those absolute same values. They reached out very importantly to garden clubs and sportsmen's organizations, groups where there was the presumption that they couldn't have the same value; there was the presumption that they wouldn't support this idea of wilderness or land protection.

One thing that we didn't do so well back in the '50s was ask local people what they thought. There was virtually no consultation at all with Native Americans during the initial stages of this planning and all the way through 1960. So, as the wildlife range was being declared, there had been thought about local Native Americans, but no consultation, no asking them what they thought. So we really fell short on that. The consideration was actually there right from the beginning; Olaus Murie saying, you know, he really felt that people had a place on the land, that sustainable hunting could and should be allowed, that this was a right of Native Americans; so, not your standard "lock it up, kick 'em out" view of wilderness. But people weren't asked what they thought, and it was only later as we went through ANILCA very importantly had Native consultations. And now as threats continue to arise to the coastal plain in particular, the larger conservation community has embraced the voices of Native Americans and helped to support them and amplify them in this work.

So what does that mean? How does that take us to an international world? This, to me, is the core of what we've been doing internationally for quite some time. It was not difficult moving into somebody else's country to see that I couldn't speak as a citizen, that we needed to listen to local people as well as national interests, that there had to be new ways of talking to folks, allowing those voices to be raised, that being the only way to achieve long-term success. So this has become standard practice in most of international conservation work. It's really the bedrock. People matter, perspectives matter that we need. We're still not great on this and still have a long way to go, but we are getting far better. And, again, I think a lot of it has to do with the fact that our differences were so, so visible.

I think the Arctic is an inspiration for us, and it's something we can aspire to in more and more places. The Arctic, the Arctic Refuge, this amazing wild area, this amazing wilderness is a true exemplar for this country and for the world. It has inspired many of us. It teaches us continually about what it takes to do conservation and to do it successfully. It challenges us politically. Its story is a story of great people, long ago and today, people who have vision, people who are passionate, people who are tremendously determined to fight for this land, people who dared to imagine that we could protect this immense body of wildness and wildlife in our country. I think it sends a really important signal across the globe, and it's the signal that is being listened to and attended to by others in other parts of this world.

Dr. Roger Kaye: "The Last Great Wilderness"

I noticed how often the Refuge founders referenced or placed their context for this place in the larger context of the planet, of the earth, the globe, and the world. I didn't realize the significance of this larger context for quite a while, until I found, deep in the archives at the University of Alaska in Senator Bob Bartlett's files, this yellowed letter that Olaus Murie had sent to him and that he had saved and donated to the archives. Well, it was a desperate letter that Olaus had written in late 1959. Now remember, Bartlett was the most powerful, strident opponent of the refuge proposal. Although an establishment bill had passed the House of Representatives for the Arctic Range, Bartlett was able to keep the bill tied up in his Senate committee and he wasn't going to let it out. Time was running out, so Olaus Murie, with nothing to lose, decided to write him a letter, and he knew the Senator. He wrote him a letter and he disclosed this ulterior motive for the campaign founders that you didn't often see in writing; it seemed rather implicit. But he told the Senator in this beautiful letter, "This is a bigger question, really, than some of us (saw)." And he was referring to recreation, wildlife, and stuff like that. This was a real problem that the campaign stood for, this notion, "What notion of progress should this landscape represent?" Well. the Senator wasn't persuaded and he blocked the Senate vote on the bill; legislative efforts failed. Responding to very strong public pressure, Secretary of Interior Seaton established the area through an Executive Order. That order gave it a rather simple, straightforward legal purpose, and two words are especially worth noting here. Never before had a wildlife refuge been established to preserve values; unlike parks, refuges are more pragmatic kinds of places that are there to protect and propagate favorite species of wildlife. Well, here comes a place that's purpose is to preserve values. And very soon the Arctic Refuge became quite an anomaly for the Fish and Wildlife Service; in many ways it still is. An agency whose tradition, as Tom had earlier mentioned, is resource management, wildlife management, land management, everything's management, was initially very much perplexed by its new charge for stewardship of naturalness and wildness, and sometimes it still is.

Well, to summarize the legacy of the Arctic campaign from its origin and Bob Marshall's wild vision for permanent wilderness frontier across northern Alaska, the Arctic campaign had succeeded in establishing the nation's first truly vast, ecosystem-scale conservation unit. Importantly, it was a place that virtually exemplified the natural qualities that the Muries, Zahniser, and many others sought to protect in what became the Wilderness Act.

But it's important to note that there's much more to the legacy than protection of those superlative natural qualities. The fact is that this place embodied the founders' more encompassing hope for the wilderness concept. That it might stimulate Americans to think beyond the traditional conservation of resources to protection of whole ecosystems, but even more, beyond that, to rethink their relationship with the biosphere that we jointly inhabit. So, as was intended, the Arctic Refuge has become a symbolic landscape. Today, for many people the Arctic Refuge stands as a national symbol of what Olaus Murie described as "the real problem," and that is where it will draw the line on our profligate and unsustainable behavior towards the natural world. And proponents of developing this area, the coastal plain, have also recognized the iconic stature of this area. They frame it differently than conservationists, as did the Fairbanks newspaper, when it made this among its many complaints about the environmental groups. I think that was a true statement: "And so we see that today, very much like it was in the 1950s, not much has changed. The Arctic Refuge controversy is again about much more than just preserving this distant place and its wildlife and its wildness. The efforts to secure inviolate boundary of lines around what's now the Arctic Refuge have served, and they continue to serve as a kind of national test of the boundaries that American society is willing to place on our consuming quest for an ever, ever higher material standard of living." Leopold's statement from the 1940s; one wonders what has changed.

So now again, especially with climate change, we face a new order of environmental threat. We're confronted with Murie's original question of whether our children's children will even inherit the same earth, and the issue of what future for this last great wilderness has come to symbolize that question. The defenders of this place are finding inspiration and hope in just knowing thatt phrase one sees all the time in relation to this place and just knowing this wilderness is out there. As Olaus said, there's a little portion of our planet left alone; left alone as the founders had hoped, to remind us of our interdependent relationship with this finite earth, to represent our willingness to accept restraint and limit our effect on its community of life. And finally, left alone, perhaps, to reveal that better part of us that still holds reverence to the natural world of our origin, our membership, and our obligation.

Brad Meiklejohn

Left: Hands on the Beach Arctic NWR.

Below: Bob Smith, flyway biologist of U.S. Fish and Wildlife Service, and Everett Sutton, U.S. Game Management Agent, fishing

Rex Gary Schmidt

Dr. Dave Bengston: "The National Public's Values and Interest in the Arctic Refuge: An Analysis of the Public Discourse"

The question that we focused on in this study was "What is the national interest in the Arctic National Wildlife Refuge? What are the national public's values and interests in this remote corner of Alaska that is so far removed from most people's experience?" In other words, why do people care about it? So, in this study we're looking at the current-day national public's values and interests. And it's an important question; for one thing, because, in democratic societies, the rule of the people regarding the management of public lands is an important thing that has to be considered. It will be considered, one way or another, in our political system. From the establishment of the Arctic Refuge, there was this focus on values: the unique wildlife, wilderness, and recreational values, unlike other units in the Fish and Wildlife Refuge System. And we know that President Carter signed the Alaska National Interest Lands Conservation Act, affirming that national interest in the area and its unique values.

This question of the national interest is of particular relevance now because the agency is involved in this major planning process that is going to influence future conditions there. So, it's easier, I guess, to understand visitors and local residents' values, interests, and concerns. You can hold public meetings, and they have been held, to allow people to express their views and their concerns and their interests and their values. You can do a visitor's study, which has been done, for those fortunate few who visit there, to understand why they care about the refuge. But it's important to also try and understand this hard-to-reach constituency of the non-local, non-visiting public. It's a bit of a methodological challenge; it will be very expensive to do public meetings across the country, but that could be done. You can do a national survey, also very expensive, but there're some real problems with survey research for issues that are not really on people's minds a lot; they're not in the forefront of people's thinking.

So the approach that we took was to analyze the public discourse about the refuge that's contained in a very large number of media articles. We used this innovative but proving research tool called *InfoTrend Computer Content Analysis Method*, and we found that media researchers and communications researchers have found that people's attitudes, beliefs, and values for a wide range of stakeholders are expressed in these stories. They're expressed in straight news stories, in which reports summarize the issues and interview and quote stakeholders. They're expressed in feature articles that explore the subject in great depth, in travel articles that present the firsthand experience of visitors, in letters to the editor in which citizens express their deeply held values and concerns, and we had a very large number of letters to the editor in this database that we analyzed. And in opinion pieces that represent a wide range of viewpoints. So, there's actually a large body of research that shows that the media both reflects and helps shape the views of the public about many issues, so much so that it's possible to indirectly measure public opinion this way.

I want to just give you a quick overview of the four main steps. It involves, first of all, downloading news stories about the refuge. We had about 2,000 very diverse magazines and newspapers that we downloaded stories from and ended up with more than 23,000 stories over the period from 1995 to 2007. It's a huge amount of text that really captures a large amount of this public discourse about the Arctic Refuge. Secondly, some of the stories that made… For example, a story about a political candidate, and they're asking questions about a wide range of public policy issues, maybe one or two paragraphs is about the Arctic Refuge. We don't want to analyze those other paragraphs, so we get rid of those; we filter them out using a computer technique. And then the real guts of it is coding the text, which involves developing lexicons or dictionaries of words and phrases that relate to the different concepts you're trying to capture, and creating some computer rules, which we call idea transition rules, that tie those lexicons together to get at more complex ideas. And then, finally, when the coding is all done, there's a final check to make sure that things are coding accurately for the concepts of interest.

The findings I want to focus on today: first, there's a set of ten prominent refuge values and interests that emerged from this analysis of the public discourse. Second, we'll talk briefly about the relative frequency of expression of these values, which is one measure of their importance in people's minds. And third, we'll see the co-occurrence of these values, how they're related, just very briefly, the relationships between those. This is the value system that emerged from the public; analyzing the public discourse, there are six broad categories of values: "Wildlife and Ecosystem Values," "Non-instrumental Values," "Recreation," "Protection," "Native Concerns," and then "Oil and Gas-related interests;" 10 values that relate to refuge purposes and four that do not. These were about oil and gas development, which was not our

focus because its' not related to the purposes of the refuge as established in the establishing order and in ANILCA.

So, under the broad category "Wildlife and Ecosystem Values" were these four specific values that emerged: "Wildlife Species," "Caribou," "Wildlife Conditions of Concern," and "Ecological and Natural Process." Let me give you just a quote of each one of these values, and I put these quotes up there from our database of media stories because this is what we're actually measuring, verbal expressions or textual expressions of these values. First of all, the "Wildlife Species" value included both discussions of specific species, including caribou, but also general statements about the importance of wildlife such as this one: "The diverse and spectacular wildlife." We coded separately for the concept "Caribou" because it's the flagship or iconic species, the poster child species for the refuge, and we wanted to see how much of the people's concern about wildlife revolved around this one species. "Wildlife Conditions of Concern" was more ecologically informed: concern for wildlife related to the importance of habitat and the requirements of the wildlife, such as this mention here in the quote of the critical calving ground on the coastal plain. And then, finally, "Ecological and Natural Processes" included expressions of a wide range of ecological values related to ecological conditions, systems, processes, services.

There were also "Non-Instrumental Values" of the refuge, and the way I like to explain "Non-Instrumental Values" is that we value something instrumentally when we care about it as a means to an end; so, I value this pen because it's a useful writing instrument. We value things non-instrumentally when we care about them as an end in themselves; they have a good of their own. It's the way we value our children and our spouses and other people, and many people value nature both instrumentally but also non-instrumentally, or intrinsically. So, there were these three main non-instrumental values: first of all, "Wilderness Aesthetics," which involved expressions about the scenic beauty and especially the wildness and the naturalness, the natural beauty and the wild beauty in the refuge, and freedom from human influence, and that as a component of the aesthetic value. "Bequest Value" is the importance of leaving wild lands as a legacy to pass on to future generations. "Moral/Spiritual Values" are these deeply-held connections with or obligations to nature, regarding it with love, respect, reverence, and affection. And here, this example mentions the refuge as a sacred and spiritual place.

There are also a lot of expressions related to the "Recreational Value" of the refuge, despite the fact that so few people visit there. Here's an example of this: these were not our typical statements about the importance of outdoor recreation; they focus much more on the profound impact that the experience had on visitors, statements like "Once in a lifetime experience," "life-changing," "life-transforming," "soul-stirring" experiences. So, it's a deeper kind of recreation.

"Protection" was a very widely discussed concern or value related to the refuge. We need to protect, preserve, and conserve this place. Often times these were made in the context of discussions about drilling in the coastal plain. So, here's an example of that; most people want it resolved in favor of preservation.

Finally, the last of the ten values that relate to the refuge purposes, the "Value of Protection to Native Peoples," included expressions of the importance of protecting the traditional cultures, life-ways, and subsistence uses of indigenous people who use the refuge.

There were some other values that we didn't formally code for; these were not expressed as often, and they're also… the first two, "Existence Value" and "Symbolic Value," are kind of slippery concepts, difficult to get the computer rules to work accurately on. But we found these, and they were important values. "Existence Value," of course, is the benefit that people receive simply from knowing that an environmental resource exists. "Symbolic Value" is the symbol of freedom, our nation's frontier history, our cultural heritage, and so forth. There was also a lot of discussion about the importance of migratory birds originating in the refuge as well.

So, we looked at how frequently these ten values occurred. "Refuge Protect" was the most prominent value; people care deeply about protecting it. Oftentimes, this "Protection Value" is in the context of the other values: of the beauty, the solitude, the spectacular wildlife. Those are the reasons for wanting to protect the refuge. The other prominent values were the "Wildlife Species," the "Ecological and Natural Processes," and the "Wilderness Aesthetic or Beauty." Some of these other values were not expressed as frequently, but that doesn't mean they're not important, because, oftentimes, there are things that we care about very deeply that we don't express very often. Maybe we don't tell our children that we love them as often as we need to, and it's sort of like that here, with these deeper, more personal values, as well. They're just not as prominent a part of the public discourse; that doesn't' mean that they're not important.

I mentioned we did a comprehensive matrix of the co-occurrences of these values; it's a 10x10 matrix, which was the "Co-Occurrence of Refuge Protect with the Other Values and Interests." "Wildlife Species," "Ecological/Natural Processes," "Wilderness Aesthetic;" these are the most common reasons that people want the refuge protected.

We found that the Arctic Refuge has a very large, broadly-based, non-visiting constituency who value this area in many different ways. Some of the values are tangible and instrumental, such as the recreational experience or subsistence uses. Others are intangible and non-instrumental, with deeper values: bequest value, moral and spiritual values. Not surprisingly, the wildlife is a very prominent value; it's a wildlife

refuge. But I thought it was kind of surprising that expressions of ecological and natural processes value were almost as great, and I think what that indicates is that the public has a concern for the refuge's wildlife that extends beyond just individual species, individual animals, and their population numbers; it's the natural context in which wildlife occurs that is also important.

So, the implication for the folks who work on the refuge—I won't call them managers, because that would imply too much manipulation of things—is that there is, and there needs to be, a concern about maintaining the natural roles, interactions, and population dynamics of these species, and letting that continue. The overarching concern, as I said, was protecting the refuge, and this is the theme that really emerged most prominently, and it's linked with wildlife species, ecological and natural processes which showed that greatest level of co-occurrence together; these are closely linked values.

To me, this suggests that the most prevalent motivation for supporting protection is the protection of wildlife and the perpetuation of these natural processes in which they occur. And that is really the national interest in the wildlife, in the refuge.

Lowell Sumner

Caribou, Lake Peters, Arctic Alaska

Arctic National Wildlife Refuge Managers' Reunion Moderated by Greg Siekaniec, Chief, National Wildlife Refuge System:

Former Arctic NWR Managers Ave Thayer, Richard Voss, Glenn Elison, Jim Kurth

Greg Siekaniec: All right, as we work to get everyone kind of microphoned up here, I'll do just a little bit of a brief introduction. And the gentlemen that are sitting up here with me really probably have very little idea of what the structure was that was planned for this, and, to tell you the truth, I'm kind of sitting there with them. But really, I think the intent is to sort of have a dialogue with four managers of Arctic National Wildlife Refuge. Sorry, but I think there is an application of the word "Management" that does go to a place even something such as Arctic Refuge because there is an element of tending to the commercial uses for the benefit or for the continuance of recreational enjoyment, and from the wilderness ideal and perspective. I thought about perhaps using "Stewards of the Refuge" but I didn't like the way you described that as being really in charge of the swine maybe a little more complicated. But anyway, the way we're going to run this is have the gentlemen introduce themselves a little bit, and we have a series of questions here. Really intended to be a little bit of a free sort of dialogue, we're in the middle of a vision process now for the Refuge System and we're working with a number of sort of our younger generation, the next generation of conservation leaders. And they like to refer to things as sort of organic, a little bit of free flow, there's no rules, there's no structure. Then the old folks say things like, "So you get no results?" You know, "Is that where we're headed?" So… Not really, but the intent here is really to hand it over to these four gentleman, we're going to have a little bit of an introduction. I think as they introduce themselves, I'm going to become extraneous to this process, but a little bit about perhaps, as you assumed the manager's role for Arctic National Wildlife Refuge, what do you feel that you perhaps inherited as you stepped into that role? And perhaps a little bit again is to follow that with your perspective as you accepted this assignment of refuge manager and seeing what the manager before you had dealt with, and what your perspective was on assuming that assignment. So Ave, I'm going to hand it to you, and you can start us out, if that's all right.

Ave Thayer: I was working on the Kenai Moose Range during the time that the activities that resulted in the Arctic Refuge were taking place; I did not have a part in that, although I did follow it, of course, in the news. My first exposure to the refuge was in 1958, and I was flying the south side of the refuge searching for the Director's airplane. I thought at the time, even though I'd been all over Alaska, in the Aleutian's, Amchitka, southeast, and so on, that the Arctic Refuge was clearly different, even for Alaska. Then later, in 1966 and '67, I made trips from Kenai up to the Refuge, called in surveillance and patrol mainly to see what was happening, and I wrote several magazine articles about it—not about patrol, about the refuge. Then

finally, in 1968, I left the refuge division and transferred to the law enforcement division in Fairbanks. So, that put me close to the Refuge, and it was my intent to spend quite a bit of time there protecting it, but I was sidetracked quite a bit by activities in Prudhoe Bay. But when I became manager in 1969, I devoted my attention entirely to the Refuge. One of the first activities was to remove debris, primarily 50-gallon aviation fuel cans. At that time in Alaska, it was common practice for aviators to leave their empty fuel cans wherever they were finished with them; that was clearly a practice that had to stop. I contacted the owners of the cans, and for the most part they willingly came and got the cans and commented several times that they were meaning to do that anyway but hadn't quite gotten around to it. At Peters Lake there were hundreds of empty 50-gallon fuel barrels; we got those out of there by taking volunteers to the lake in the summer and gathering the barrels all up in one place; then in winter, with the Hercules cargo plane that had taken supplies in for the Arctic Research Lab, hauling all the barrels out.

When I first became manager, I received lots of suggestions about how the refuge should be managed, and one of them was to build a runway at Sheenjek River, and that was not done. Another suggestion was research stations, little cabins scattered around the refuge. That was not done; the obvious problem with that is we don't know where the research need is going to be, and henceforth just as well. Another memorable suggestion was a serious official suggestion that we have a series of trail cabins one day apart throughout the refuge, and these cabins were to be in the form of an igloo, made out of Styrofoam; the bears would enjoy that quite a bit. That was not done.

But my first impression of the Refuge when I first made the trip up there was that it was a sort of organic perpetual motion chain, and required: (1) protection, and (2) inventory. And from that point the management became more similar to the management of other refuges.

Greg Siekaniec: Okay, well, thank you, that was a great start. Why don't we jump over to Mr. Elison; are you ready to give us a little bit of your perspective?

Glen Elison: I'll be happy to; I appreciate it, Greg. For me, the Arctic Refuge was easily the pinnacle of my personal professional career; though in later years I'd hold higher positions in the organizational food chain, easily, the Arctic Refuge was the most satisfying.

I came to the Arctic Refuge from the Alaska Peninsula Refuge based in King Salmon, where mainly I dealt with surly brown bears and surlier brown bear guides. You asked me to describe what I inherited and I had a candid answer for that until I heard Tom talk about the etiology of stewardship, and I kind of revised my view of what I inherited. It was a time, as I think about it and look at the four of us sitting here, when we all managed the same natural landscape, but the political landscape we dealt with varied a lot. And I think that it resulted in all of us having very different experiences.

My tenure spanned from about halfway through President Reagan's first administration, all the way through the end of the first Bush administration, when I arrived at Arctic; the same Secretary, James Watt, was still in office. It was a challenging time for conservation; it was a time when opening the Arctic National Wildlife Refuge to oil and gas development was a huge priority within the Interior Department. The Assistant Secretary made very clear publicly that it was the number two priority of the department, behind only opening the Outer Continental Shelf. Opening the Arctic Refuge was a standard applause line for several years in the President's State of the Union message. If you could imagine a single resource issue rising to the level of the State of the Union, it spoke volumes about where the Administration put its priorities. And then a few weeks later, it would creep into the President's budget message, affirming that we were going to ensure national security, energy independence, and put x-number of billions of dollars in the U.S. Treasury by opening the Arctic Refuge. So, it was a very, very contentious time, a time that was really tough on the staff of the Arctic Refuge.

The staff of the Arctic Refuge was… The whole program was just so counter to the values of the staff and what the Refuge represented, what they were committed to; it was just a miserable experience for an awful lot of them. The staff wrestled with it for many years; it was just the kind of thing that was constantly something we dealt with. We simply hated the whole program, but they soldiered through in varying degrees of willingness, and it dragged on for the entire 10 years that I was there.

One little vignette I'd like to share with you that I think captures it is we had completed a report to Congress and the Secretary's recommendation in 1987; it was the report mandated by Section 1002(h) of the Alaska Lands Act. In due course after the report had been delivered, we received a stack of certificates that had been signed by the Secretary, and somebody from the regional office came up to deliver and present these awards. The staff, one by one, sort of shuffled up and took their piece, that full parchment that you get that goes in the $2.99 Wal-Mart frame, and went back to their seats, and it was kind of quiet. As the staff filed out after the meeting, about half of them threw them in the trash. My deputy at the time was just apoplectic; he just couldn't believe that anyone would throw into the trash something that the Interior Secretary had signed, even though it was his signature machine. I said, "You know, you have to understand the values of the folks here." I said, "Giving them an award for helping to open the Coastal Plain of the Arctic Refuge is like awarding Davie Crockett and Jim Bowie and Colonel Travis for opening the gates for Santa Anna to get into the Alamo." It just was something that went completely against the grain.

So, that really symbolized for me a lot of what the staff wrestled with; it was something that we dealt with just constantly. The political oversight was intense, getting calls from all sorts of people in all sorts of political positions offering their view of biology that they had no knowledge of, but nevertheless wanted to see certain things reflected. So, it was a very different kind of time for the Refuge. It was a time when I made a personal decision that the only really sustainable course for the Refuge staff and the organization as an entity was to take a very rigorous approach to what we projected. We needed to stay out of the role of advocacy and simply provide the science and the facts and the information that we could. There were huge numbers of lobbyists and activists on the pro-protection side; they were very vocal, very well organized. On the other side, the pro-development side and the state of Alaska were very well organized, very loud, very well politically connected, and very, very well-funded.

So, we threaded the needle of staying to the straight and narrow, as I described it. It was the "Sergeant Joe Friday" approach; just the facts, Ma'am. We just really needed to stay to what we knew and what we could defend, because if we'd gotten into the role of advocacy in either side, then our credibility would immediately have been devalued or lost all together. Having said that, the staff at the Arctic Refuge, as always, was very resourceful, and my suspicion is that some of the staff burned up a couple of copy machines and melted down who-knows-how-many telephone lines getting information out into the public forum. You might think of it as sort of a progenitor of "Wiki Leaks." It was good because it really fueled the debate, and certainly was a lot of faster than the FOIA process. So, that was all part of the dynamic that we dealt with for all those years, and I'm pleased to see some of those folks still in the audience here to share this experience with us.

My tenure was a time when there were an awful lot of VIP trips, and while I was up there, there were probably thirty or forty U.S. Senators that came to visit. One evening in particular, we had the entire Senate Energy Committee there, 10 U.S. senators—1/10th of the United States Senate—came up to look at the Arctic Refuge. We had probably a couple hundred Congressmen while we were there; we had hoards of luminaries and semi-luminaries. Back in those days, the oil industry would give a free ticket to anybody that was willing to come up that they thought could have any influence at all in the debate, in the decision. I remember one particular day being in a helicopter flying over the Coastal Plain with June Lockhart—if you don't recognize the name, that's Lassie's mom. I have no idea what the industry thought Lassie's mom was going to do to get the Arctic Refuge open, but there she was.

It was a whole litany of those kinds of visitors. Those trips, though, were highly criticized; in many places, they were very controversial, there's a lot of criticism about that. I took a countervailing view; I believed then and strongly to this day that in order to influence people, to get them to share our values about the Arctic Refuge, we need to get them out on the ground for as long as possible. They need to experience the beauty, the wilderness, the wildlife, the solitude, the clean water, the clean air, all of the things that we value. And even if we can't bring them over to our side, I think it makes them more empathetic when they do get to a decision, input, whatever, sideboards on whatever that decision might be. I smiled when I saw one of Roger Kaye's pictures; there was a picture of a gentleman sitting on top of a mountaintop, then a lake way in the background, a beautiful, beautiful mountain lake; that's Peters Lake. And the gentleman sitting on that mountaintop was Max Baucus, the senior senator from Montana. You know, there are lots of funny stories about those days, and I'll be happy to share those stories later tonight with the first twelve people that buy me a beer!

But you know, it was just one thing after another for that time we were there. It was a really, really exciting time. I don't remember taking any classes that prepared me for it, but I met a huge number of people, got to do a lot of things, and it was incredibly fulfilling.

As President Carter was speaking yesterday, I was thinking about the 25th Anniversary celebration for the Arctic Refuge, which was a much more modest affair; if my memory serves me right, it was in the cafeteria of Lathrop High School in Fairbanks. It was lightly attended; the senior Interior Department official was the Regional Director, who read maybe the most wooden statement I've ever heard, and it was probably clear, at least to the Assistant Secretary level who showed up, he read his statement and disappeared as fast as he could.

But there were many, many supporters of the Refuge, and the high point for me was meeting Mardy Murie, hearing her speak, and then she very graciously gave me a gift membership in the Wilderness Society, a gesture that I cherish to this day. So, it is very pleasing to be here 25 years later in this great, great facility, surrounded by the history of conservation, talking and interacting with you who have defended the refuge, who made it possible. And I look forward to continuing the dialogue as we move along through the day.

I want to take a minute, though, while I'm thinking about it, and recognize a few folks who are not here. One of them is the fifth refuge manager who served up there and is long since deceased, Buzz Robbins, who was the senior biologist at the National Elk Refuge before he came up. I recognize Gerald Garner, who was the supervisory biologist for most of the 1002 Program; for those of you not familiar, we produced volumes and volumes and volumes of information. Garner was a great scientist, he was a very difficult, tough taskmaster, he was… He hadn't really dealt with his feminine side yet, he was really tough on people. But he accomplished a huge amount, and a lot of what we have in the record from those early days in the early and mid 80s was through Garner's leadership. He passed away at a bear conference,

either in Montreal or Toronto, many years ago. Three folks from the NGO community that I dealt with a lot and have huge respect for were Jack Hession, with the Sierra Club; Allen Smith, with the Wilderness Society; and Dave Cline, from the Audubon Society. They were there at the genesis of the Alaska Lands Act and going back even prior to the Native Claim Settlement Act, and certainly they were great guardians of the Arctic Refuge as it was implemented and the 1002 Program progressed. So I think I owe a personal debt to them; I have great admiration for them in their professionalism.

Greg Siekaniec: Thank you, Glen, that was a great explanation of your start with Arctic and carrying on. Mr. Kurth, how about if we jump to you?

Jim Kurth: You know, Greg was my boss, and he is quite a snappy dresser over here! I don't get a uniform allowance anymore.

You asked what we inherited there, and I'm quite certain I'll spend the rest of my life trying to figure that out. When I went to Fairbanks in 1994, I'd been around a while; I opened up five national wildlife refuges all over the lower 48. I'd been in the regional office in Anchorage for three years; I had been through the Service's upper level training program; I spent several months working on Capitol Hill during the 1991 debate over the Arctic Refuge. And I felt very well equipped to do the job of being a refuge manager; I knew how to administer a national wildlife refuge, and I had a diversity of experience. But I'm quite certain that I perhaps didn't have the humility that Roger and some others had talked about. My lovely wife Tricia, there, who's got her master's in counseling psychology, has told me at times that I need self-esteem reduction therapy! And it's a place that just takes a long time to understand; I think all of us would admit you never get to know it, that it's too big to know every nook and cranny like you can in a refuge in the lower 48. And so, I'm not really quite sure how to answer that question.

But the job at hand was different. I'm quite certain that I had the best job of the four of us, and the whole time I was there, there was nobody in the food chain above me that wanted to do anything other than protect the place, so I didn't have to deal with some of the adversity that these gentleman had to. When I moved up, the 1002 studies that Glen had shepherded through were winding down, President Clinton was in office, the Congress was Democrat on both sides, and I figured I'd have at least a couple… And just a couple of months after I was there were the 1994 elections; the 104th Congress came in with Newt Gingrich and the Contract on America, and the desire to overturn many of the environmental laws of this country, and all of the sudden the job changed overnight.

The first year I was the refuge manager, I spent ten weeks in Washington of my first year at the Arctic Refuge. I remember there was a conference that was set up by the Alaska Wilderness League and others, The Wild Alaska Conference, and they were going to talk about the threats to the Arctic, the threats to the Tongass Forest. It was in February of 1995, and I looked and saw that there was no one from the Fish and Wildlife Service on the agenda to talk about the Arctic Refuge. My job at that time gave me an opportunity that Glen didn't have, and that was I could be the advocate. Not the advocate to determine what the policy was for the place—the president had done that—but someone who could take all the work that had been done over the decades before, the science that the Fish and Wildlife Service had come up with, and give voice to the land. And I'll never forget that first speech there at that conference in Washington. I found myself on the agenda between John Seiberling, who was Mo Udall's subcommittee chairman during the D-2 Debates, and Norma Kassi, who is just a marvelously eloquent Gwich'in woman from the Yukon who was a member of the parliament there. It scared me to death, and I don't really remember what I said, but I felt good that the Fish and Wildlife Service could come to a national stage and explain why this place is important. I think that that's what I intended to do, and the time I was there was to learn some of these things and to be able to share those things with other people. I don't know how effective I ever was at any of that but in the end, I was able to make the same statement that Ave and Glen and Buzz made, which was "Not on my watch." They didn't get in.

It was a place that perhaps I didn't go into with the requisite humility, but I know that during the years I was there and the decade of time afterward, it certainly humbled me.

Greg Siekaniec: Thank you, Jim. Well, let's keep right on moving through. Richard, you're active manager, you're present manager.

Richard Voss: Yep, '99 to today. I'm an inner-city ghetto kid raised in the San Francisco Bay area, a knife culture; life was up close and personal. I thought maybe there were better ways to do things in better places, so in 1965, I fired up a motorcycle and rode up the, at that point, gravel highway to Alaska. And pretty quick, I realized I could work here, I could live here, this is pretty cool. But it took me 25+ years and a trip to Vietnam and college to finally get a full-time paying job. Previous to that, I worked across the western United States at I think 15 or 16 refuges in seven states and five countries, in a lot of actively managed refuge units where you burn, ditch, dike, road trails, control hunters that use capacity zone places; that was just the way you did it. In fact, I came from Hawaii to Tetlin, Alaska in '95. Hawaii was… if it wasn't introduced, it was endangered, the place was totally changed from 3,000 feet down. I worked on a garden island, which was… there were no native plants there, in fact; it was all a beautiful place, but it wasn't a natural place. So my wife and I, bless her heart, she wanted to go, leave Hawaii. We went to, of all places, Togiak, Alaska, maybe the coldest place on the earth; it certainly felt that the first year. We worked with Athabascan natives and worked

at visitor's centers, the people entering Alaska by road, and tried to learn and understand how the regional office worked and interfaced with huge refuge units, instead of little postage-stamp refuges they had in Hawaii…

After Jim left, I got the opportunity to go to the Arctic Refuge. I certainly had a vision of what I thought the place was. On my first trip there, Fran Mauer and Roger Kaye told me what the place was like; we spent the next… Actually, it must have been close to a week-long trip that was supposed to be two days, as we tried to get from place to place, you know, realizing you're going sometimes over 300 miles to go to work in the morning, through five different weather systems. I knew I was in a different place, a landscape-scale place, where they took me out to untouched places where the rhythm of nature was the only thing happening there. There was no doubt in my mind we would land and there would be just our beating heart in the place, nothing else going on, and I thought I'd died and gone to heaven! But then of course they stopped off at a place on Glass Lake, at a landing area—we don't like to call them strips, just an area where planes can land—and they proceeded to walk me about and show me the sign of man, the hand of man. A hunter camp of a commercial guide group was conducting business in a very hard-on-the-land manner, an intensive manner, and they said, "Fix this, this is not right, it's not what the place is set up for." So, that was my opening into Arctic Refuge; it took us four or five years to can that person, but we eventually did. They had showed me places on the Kongakut River where there were increasing activities, and that we needed to something with that, too. So, we went through a special use conditioning process with the commercial operators to limit group sizes, control group sizes, and control where planes could land, try to set the clock back, set time back. I felt this was cool; these are effective things that managers can do.

Then, I suppose a couple of years into that, there was a change in administration, and there was another controversy that resurfaced, and I again found myself full-time working in oil and gas issues, going back to D.C. But even then, I felt my job was to keep the staff focused on best science, being aware of our history, and just repeating the facts. I found that a lot of the controversy was so based in information and spin, spinning information, and I didn't necessarily know the hearts of a lot of the people that were doing this, but lying certainly occurred to me, too; they would lie about information. And I would say both sides of the issue; I'm not going to cast dispersions on any of what I knew to be science and facts. So at that point I think my goal was to fly under the radar of all of the politics and just keep the staff buffered and shielded so they could conduct long-term ecosystem monitoring so we could get good baseline data on what's really here over time. Maybe we saw climate change even back then, but to start getting controls of those things and certainly keeping an idea of what's happening in the public view so we can maintain a sense of place and the experience that people had come to expect on the refuge. Then, there was a core team of, bless their hearts, our interpretive people and the deputy—I've used up four or five deputies, I think, in my time—to assist us in getting the best information out.

And we're here today. Certainly, the 50th was a wonderful effort; it started as a bootleg operation and it developed synergy/energy from across the nation. I think Jimmy and I were really shocked at the little seed ideas that we would get together and talk about, as we'd float down the Sheenjek River or something, and then find people like the person right here to my right to pick up a sword and help us with the process, all the way up to and including Strickland and Salazar, that recognized the value of the place. And I felt after, however long those were, eight years, it was nice to be communicating and cooperating with people instead of confronting and shielding, and it's been a good time and still is.

Greg Siekaniec: Thank you, Richard. Before we jump away from you, though, and for all of you to think about quickly, what's your favorite place on the refuge?

Richard Voss: Well, of course, there is no main place on the refuge; it's all shiny mountains and untouched places. It's so unique, whether you talk about the Southside, the Brooks Range, or the Coastal Plain, they are so different, but they are so connected. I would say anyplace that you can float. I'm a river nut; I love to float and I don't float nearly enough, so there are… I think the South Slope rivers are sublime and it's not… It's a comfort level I feel in that environment versus the raucous North Slope rivers that are beautiful, but I think prefer the South Slopes. And then any place you can walk, which is everywhere.

Greg Siekaniec: Thank you. Ave, do you have a fond memory of a place?

Ave Thayer: Well, many actually, but I have a favorite… Wherever you put someone, they'll be happy.

Greg Siekaniec: Wherever you put someone, they will be happy?

Ave Thayer: I think so.

Greg Siekaniec: Wow!

Ave Thayer: It might take a few days in some places!

Greg Siekaniec: It takes a little bit to get the conveniences of man behind you and start to enjoy and immerse yourself in the area, but that's a good answer. Thank you. Mr. Elison?

Glen Elison: Well, as these gentlemen have pointed out, it's hard to pick one. I was looking at Roger's photographs as he was bringing them up there; there was a picture of a person walking up the hill through a field of cotton grass with some clouds in the background. That's up near the head of the Idyllic Valley, and the fellow was a writer/

photographer for National Geographic, a spectacular area. But like Richard, I'm a huge fan of river floating. I prefer the North Slope ones; if I had to pick one, it would probably be the Marsh Fork of the Canning. But I've done most of the floatable rivers in the refuge, and they're all grand, so it's very difficult to pick one, and certainly the Marsh Fork is right at the top of my list.

Greg Siekaniec: Mr. Kurth?

Jim Kurth: The place is called Buck Mountain. Those of you that would be horrified that I would name the place, the trick is only my wife and Fran Mauer know where Buck Mountain is. We gave places names, and I think that's quite typical of many of us because nothing has a name, and in your journal or in your memories you give places names. And I think for me, the favorite place in the Arctic Refuge was the last place you always were because the memories are the most precious. But Buck Mountain was a place where my lovely bride and Fran and I took a splendid hike, and it is quite special.

Greg Siekaniec: All right. So, I think Richard started talking to this a little bit, but let's hear from a few other folks. People management—you know, it was guides and outfitters and perhaps air taxi transports, and how has people management sort of changed while you were there, or what were your biggest issues? Let's roll down to the end there and start with Mr. Kurth on that.

Jim Kurth: People management?

Greg Siekaniec: People management; did it change in your tenure, did you have issues you had to deal with, did you have controversy over it?

Jim Kurth: It was a transitional time, I think, for the Refuge. We didn't have the… I don't think you can just imagine what the workload and the business was when Glenn was there with the 1002 studies, and we were winding down from that. I hadn't been there long, and Roger, he comes to my office and he says, "I want a new position description." And I said, "Okay." I said, "What do you want to be?" And he said, "The refuge needs a wilderness specialist." And I said, "What does that mean?" And he began to describe to me some of his ideas and I said, "You know, Roger, this is easy for me to talk about in the abstract, but you go back and write it up and then we'll talk about it." And he did and, you know, again, it goes back to first comments about still trying to figure out this place. And Roger was much more advanced in the evolution of his own thoughts on the place and what its stewardships required. And maybe it was the first humble thing I did, as I had to just sort of realize that you've got to rely on people who know more than you do. I think at that time Roger was given a bit of a green light to try and bring wilderness stewardship back to the forefront of how we administered the refuge. That's not saying anything bad about what had been done before, but Glenn's job was just incredibly difficult to do that research program, and it was over, and so it was a time for us to reflect on what the path forward was. So I think that we tried to bring the focus back off the Coastal Plain, to the larger place, and to begin a discussion about our sense of stewardship. It was interesting at that time, you know, the internet was a new thing, and I've always thought that we in the Service could use technology better. We begin to have this discussion about an Arctic Refuge website and it was a full year discussion as to whether or not we should even have one. Not what it should do, not what it should say, but what did it mean to some of these symbolic values, to these unknown values. I really felt completely out of my element; we were talking about things and values that I didn't know. But I think they were worthwhile and I think that, you know… I also was a short time there, only five years compared to these gentlemen. But I think that the staff there was able to start to bring this stewardship of the wilderness values back into the forefront, and some of the management, and Richard, I think, has done a great job carrying on those values, too.

Greg Siekaniec: Thank you. Mr. Elison, do you have any thoughts on administering the area from the standpoint of public use?

Glenn Elison: We had a few what I thought were particularly significant challenges. Again, to put this in context, we were getting the program fired up shortly after the passage of the Alaska Lands Act, which had left a lot of scars and a lot of wounds, and most of them had yet to heal. One of the things that we inherited was a whole cadre of hunting guides and outfitters who had been working in the Brooks Range for a long time; they had a very, very strong sense of possessory interest. And over time, jerking them back into the reality that what they really had was a privilege for being on these public lands, they had responsibilities for how they conducted business. That was a project or a program that was a long time in the making; it was involving the entire state of Alaska, all refuges at that time. But that was one of the bigger challenges.

Another one that was perhaps even bigger was the growth of river rafting, hiking, non-consumptive guiding, for lack of a better term; Roger can help me out with the right term later on. But we had this huge growth that occurred in about 1985, and it was a direct result of the increased focus on the Coastal Plain of the Arctic Refuge, the increased media attention, a lot of the trips were marketed as "Come see the Arctic Refuge before it's defiled." "Come and see it before it's developed." So there was this large spike, and particularly river rafting; we had guides coming up from the lower 48, a couple Colorado river guides, they were bringing large outfits, lots of people. So the concern, the dark cloud in the distance, if you will, was what's happened down in the lower 48 rivers. Whether it's the Colorado river through the Grand Canyon or the Salmon or the Snake or you pick your place, they all had the same fate, which is rapid growth and use and regulations. So we wanted to get out in front of it with a river management plan; actually, a number of the guides

George Schaller

Sheenjek Expedition, 1956 (L-R) Bob Krear, George Schaller, Don MacLeod

urged us to do it. We launched that, it sputtered along for a while, and frankly, I don't know what happened to it.

One of the things that did happen was the level of use stabilized; the cost of getting up there was so high, the season is so short, so that… And frankly, the river operators, at least when I was there, were doing a reasonably good job of self-regulating and spreading themselves out through space and time. So, the call for it was not as great after a few years, and things had sort of settled down. But those regulations and management of commercial use were probably the biggest thing that we had to deal with, and again, a lot of it was driven by the attention the refuge was getting in media all over not just the nation, but all over the world.

Greg Siekaniec: Thank you Glenn. Ave, did you have public-use-type issues early on that you had to deal with as far as the refuge was concerned?

Ave Thayer: We had some problems with hunters; they had been basically unsupervised, if that's the word, until we had budget for the refuge. And we made minor changes, slow changes, but the guides seemed to know this was coming, because it was occurring all over Alaska; we had the statehood, we had state regulations which were more restricted, federal in some cases. But it's an unfortunate ongoing event; public use will have to be restrained a little bit at a time, probably for a long time.

Greg Siekaniec: All right, thank you. If anyone had joined a number of these gentleman in the bar last night, you may have already heard a few of the stories they were perhaps telling. So, I think the next one is sort of as you traveled about, here's someone like Glenn Elison speaking of perhaps 200 congressional members, and those kinds of trip don't happen without some humorous event taking place at some point in time. So maybe the question for all of you is, can you recall something that really struck you as humorous in relation to all of the duties that you had to undertake on behalf of Arctic Refuge? And perhaps the trips you made, perhaps some of the interactions, whether it be with Congressional members or news reporters or… Any volunteers to start?

Richard Voss: I've got one; of course, I'll have be careful not to mention names. On a VIP trip on the Aichilik river, one of my first ones, a camp of maybe seven or eight people did some hiking, walking around. The morning that we were packing up to leave, people were spread about in various areas doing their business or doing camp tasks. And lo and behold, a bear came into the camp, and I mean up close and personal bear to the camp. One of the senior biologists was standing there and looked up and pointed and, in a very high-pitched voice, said, "Bear!" So we quickly saw the bear and did the appropriate bear training facilities, you know, "Hey bear, hey bear" talk. I remember running over to the tent and, as I ran over to the tent, the bear focused on me and proceeded to move

towards me, but I still got to the shotgun about that time and racked a round at him. It stopped and then looked around at everybody else, deciding, "Who else is going to run that I could eat?" I think Fran even fired a round in the air at that point in time, and it decided, well, maybe I won't eat that direction and turned around looking the other way. And lo and behold, there was an unnamed pilot, who's in this room, that was out by his plane—he likes to sleep in his plane—that didn't have a clue of anything that was going on, probably because of a hearing issue. With us yelling "Bear!" and shots fired, he just proceeded to do his business of packing up, and I remember him walking back to the plane, and the bear seeing him and running after him. And he didn't have a clue what was going on yet, so it was just a surprising thing. And I think as the bear ran over, our VIP came out of the bushes from doing her business, and now that bear switched from Roger, who was getting into the plane still not knowing what was going on… Did I say Roger? I blew it!

Greg Siekaniec: Those were just initials.

Richard Voss: And she looked at it, and I think that's when Fran fired a round in front of the bear, between the two, and he decided that, okay, there's nothing here I can eat and took off up the hill from this place; Aichilik is a long sloping hill. And I remember, not humorous, but I remember that that bear, once it decided to leave, it was just a continuous steady lope away, not panicked, a steady lope. I think 10 or 15 miles up the hill and over, never stopping, never looking, just going across the place. It was just a moment in time, and everybody that just looked at each other and, you know, that was interesting, and started packing up again. That's a typical refuge experience.

Greg Siekaniec: That's a good experience. I'm not sure, but isn't rule number one don't run?

Richard Voss: Well, not to my gun, I had to get to my gun! The rule might be that as he'd be getting closer than, you know, near where I was at…

Greg Siekaniec: I thought the other rule that went with that was, you know, as long as you have your tennis shoes on and you know you can outrun at least one other member of the party, you're in good shape!

Richard Voss: I might have been the slowest.

Greg Siekaniec: All right. Mr. Kurth, I'm sure you probably have a humorous incident you can share.

Jim Kurth: You know, the Arctic Refuge isn't a "hah-hah" funny kind of place; so much of the fun are the stories and the camaraderie with a strong drink and a cigar out of the wind some place. I did laugh quite hard… I'd been at the refuge several years, and they finally decided they could show me the artifacts from the Porcupine Lake cabin, but none of you will get that. The vast majority of Arctic humor is bathroom-related, and I don't want to go there! Perhaps one of the things that was fun in a cute way, we were camping along the Hulahula, and Don Barry, who, was the assistant secretary at the time, and Dan Sakura, who works for The Conservation Fund, were there, and Dan was young then. Is Dan still here? He was here yesterday, I know. He was laying on the tundra and he said, "Is it always this quiet here?" And later in that trip we were having breakfast, and Fran was cooking some pancakes up, and Don kept getting closer and closer and, you know, Fran finally looked at him and he says, "Don, do you want to make these pancakes?" And he says, "Oh, please, can I?" And it was just this child-like sense of wonder; he was back in camp and he just was letting go, as so many people do. And so those were things… The Arctic Refuge makes you smile more than it makes you laugh, in my mind.

Greg Siekaniec: All right, thank you. Ave?

Ave Thayer: Yes, a lot of people hike through the refuge north to south. This person, a very strong hiker, started out on the north side hiking the Hulahula River. At the upper part he had to cross the river, so he tied his boots together and threw them across the river, but they didn't make it! So he cut his tent into long strips and wound them around his feet, by that means he made it down to Arctic Village.

Greg Siekaniec: That had to be a long trip. Oh, that's very good. Mr. Elison, do you have a moment you'd like to share?

Glenn Elison: Yeah, one comes to mind in particular. I mentioned that at one point we had 10 U.S. Senators up there when the Senate Engineer Committee came up. That day was sort of a daylong Saturday Night Live routine. Starting out, it was a beautiful day, just gorgeous, and we had a wonderful tour of the Coastal Plain, and then the committee wanted to have a public meeting in Kaktovik. One of the things that I've always been impressed with is that the Inupiat are not very impressed by titles and positions, so 10 Senators showing up at Kaktovik is like, you know, they all went fishing. So, we show up in the community hall, and there's some folding tables and some semi-broken-down folding chairs, and there are a few rows of chairs for the audience. And these 10 U.S. Senators are sitting here, and there're barely that many people in the audience, you know; never had so many spoken to so few. So we have our meeting, and the beautiful night continues, and we went on up to Peters and Schrader's Lake; in fact, that picture of Baucus was looking down on Peters Lake. We fly over Schrader Lake, it's a big lake, and right in the center of the lake is a boat with one person in it. And I'm looking at this from a thousand feet up thinking there hasn't been a fish in that spot since the glacier receded. So we go on and we land, and the Senators are out, and we have a little fishing tackle, and they're fishing along the shore in an area that's got some lake trout and char. This person comes along and he's putting along with a video camera, and he's

just screaming, screaming at the top of his lungs, "Your pictures are all going to be in the New York Times and the Washington Post tomorrow." And I was standing right next to John Breaux, and I'm looking at this guy and see it was Bob Mrazek, who was a Congressman from New York at the time. And Breaux just kept saying, "Have a nice day, have a nice day, have a nice day…" You know, it was just like chanting a mantra. And I said to Breaux, I said, "That's a Congressman." He said, "No it isn't, I know them all, that's not a Congressman." I said, "It is." He said, "No, no. Have a nice day, have a nice day." So we finally got through that, and somebody recognized him and, you know, everybody laughed, had a big group hug.

And so, most of them flew back to Prudhoe Bay, I guess, but there were three or four that wanted to stay at Peters Lake. There was an old research facility that goes back to, you know, about the days of statehood, built by the Geological Survey many, many decades ago. This is a sidebar: it may be one of the best places in the world to have your favorite libation. Anyway, we had three or four folks that are Congressmen and a couple of spouses, and we were staying there. The evening progresses, and it's mid-August, so the dark is coming about midnight, and one of them decides "okay, it's time to go to bed." So he said, "Where's the, you know, where are the sleeping bags?" And I said, "Well, they're in the bunkhouse." Well, he said, "I just went in there and there wasn't anything in there." I said, "What?" He said, "Yeah, there's nothing in there." So, I went up, and sure enough, there wasn't anything in there. The Regional Director had had the responsibility of putting the sleeping bags on the Grumman Goose, and they hadn't made it. So, we called down to Kaktovik to the field station; probably Greg Weiler was down there. Our pilot had had a beverage, so he couldn't fly, so we recruited somebody in a Super Cub to fly up there. It's probably 50 minutes in a Super Cub, and they got up there just as it was getting dark. So, here comes this Cub, you can hear it coming up, it was auguring along the lakeshore, and pretty soon he gets over the camp and the first thing you know, here comes a sleeping bag out of the window because there was no place to land. So, he makes three or four passes and three or four sleeping bags come out, but by then the congressmen are all asleep! You know, they just curled up wherever, so we unfurled them and threw them over to stay warm.

But it was events like that that are galvanized in my mind. You've got to find your humor where you can, and there was a lot of it that day.

Greg Siekaniec: Very good, it might have been a cold night for a few of them!

Glenn Elison: Real cold.

Greg Siekaniec: So, a refuge the size of Arctic in a state as large and immense as Alaska, and relationships between Native communities and perhaps states and wildlife management… I mean, how were the relationships between the state when you were there as manager in regards to the wildlife conservation issues and values? Ave?

Ave Thayer: Well, initially, I don't think the State approved of establishment of the Refuge, at least the State Biologist didn't appear to; quite jealous of their authority to manage the wildlife. And we were, I think, wise to not debate that, and in doing it for some time, we had not. I think that was primarily the biggest problem that I saw.

Greg Siekaniec: All right. Glenn

Glenn Elison: We had a few things going on with State back then; one of the early things that popped up was up through the mid-80s under the administration of a governor named Steve Cowper. Cowper was much more middle-of-the-road than a lot of Alaskans about the Arctic Refuge, and he gave his agencies more free reign. In those days the State Biologists were able to speak much more freely and much more opinionated than we typically did. As an example, I remember being on a trip with a gang from Audubon that came up; it was Les Line I think was the publisher of the *Audubon Magazine* and a couple of their well-known writers. During this trip, I took one of the eminent caribou biologists for the Fish and Game along because he was a very chatty guy, and he exceeded my expectations; he talked all the time, and I didn't have to talk at all. And so it was an interesting dynamic to have the State Biologist be, in many ways, more outspoken, and being in a political position to do that.

Two other things occurred; one of them I mentioned earlier was bringing the guides and outfitters in line. The state lost the authority through a court decision, which I won't go into, but in any event, they lost the ability to regulate guides and outfitters on federal lands. And so it was, frankly, a great opportunity for federal agencies, not just the refuge system, but the park system and the Forest Service. And so we were able to put in place a whole system for improving that regulation and permitting of guides. The State hated it, but they realized that they didn't have an acceptable alternative that even they could embrace other than, you know, there was the normal political posturing. But at the end of the day, they didn't have a system that was acceptable to anybody, including their staff.

The third thing that made for great tension was the time when subsistence court decisions came to a head, and the State lost through court decision the ability to manage subsistence on federal lands. And that, to this day, creates great acrimony and tension that continues to evolve, so that's been ongoing for well over twenty years now.

So those are things that come to mind.

Greg Siekaniec: Very good. Jim?

Jim Kurth: You know, I lament what I see has happened with our relations with the state of Alaska today as one of the battles we're fighting because, you know, we had some different perspectives, but they had… I always thought the Alaska Department of Fish and Game had some of the best professionals of any state I'd ever worked in; people like Ken Whitten and Harry Reynolds, I mean, these were the best biologists in the world, and they knew the land and they were cooperative. Everybody had a little bit of their own take on things, but by and large, I looked at our colleagues of the Alaska Department of Fish and Game as friends and collaborators. On things like oil issues, at the executive level we didn't see eye to eye, but I look at those days, at least from my perspective—and maybe the staff out there are saying, "You're nuts Jim"—but I thought it was just exactly the way that things should work, where you'd look at them as partners. They've got a different job than you do, but they are your colleagues and your friends, and we worked well together.

Greg Siekaniec: Thank you. Richard?

Richard Voss: I have to say, certainly, where the rubber meets the road, the biologists, the scientists in the field are cohorts. They get along, they speak to each other, they talk, they co-write things together; in some cases, they're husband and wife, but that's not the only reason they get together and speak in a factual manner on a regular basis. At the district level, some of the managers, I believe, there's respect, at least in the ones that I've talked with, there's respect enough to know we have differing missions. And that puts us in different spots, trying to go in different directions with fish, wildlife, and harvest, and working the sport hunter and the subsistence hunter, too. So we struggle, but we can still sit down and have a cup of coffee. At the levels above that, I'm not sure we're even on the same planet versus the same state with the leadership. I always try and find common ground as a place to start, you know, you keep on stepping back, stepping back until you realize, oh yeah, we both love our kids, that's some place to start from and let's go somewhere. But it's… I don't have a way around at this point; it's just really difficult.

Greg Siekaniec: Thank you. This morning we heard a little about the constituency of Arctic National Wildlife Refuge. It does not live there, it's not place-based, and they will likely never visit Arctic National Wildlife Refuge. What does that actually mean to you? Ave, early on was that a thought that you had to give consideration to?

Ave Thayer: Oh yes, we were aware of that at that time and certainly improved, of course, and understanding, as well, the same feelings about protected areas in Africa.

Greg Siekaniec: Okay. Glenn, when you were a manager there, did thoughts of, you know, your constituency really didn't live there and was likely never to visit the refuge, did that influence your thinking in any way?

Glenn Elison: The short answer is yes, the constituency is indeed nationwide, as public interest land has been pointed out many times; in fact, the constituency is actually international, because there's that much focus on the Arctic Refuge. And it comes from a variety of views of the Arctic Refuge; obviously, we're here celebrating wilderness and grand natural landscapes, but there is a whole constituency out there that sees it as a place to drill, to extract oil, to provide jobs, to provide receipts for government, and it goes on and on. So, I think the take-home message for me is that there is a whole spectrum of values out there in the public sector from coast to coast that have a stake in this, and while I agree with some of their values and less with others, they, in fact, are the values to the individuals. So, it makes the position of being a public official, a manager, if you will, one that's much more challenging as you try to reconcile what it is that you have responsibility for as opposed to what your personal views are. Ken Knowlton and I were talking a little bit at the break. I made the comment to Ken… for those of you who don't know him, he was in the state legislature for many, many years, and is now the Alaska Secretary's rep for Alaska, stationed in the Main Interior building. Ken's a very thoughtful guy, and I encourage you to visit with him. But the point I made to Ken was that I don't think most Alaskans have any grasp of how the Arctic Refuge is viewed nationwide and why it's so symbolic and iconic, and that really has a huge influence on how you wrestle with decisions and deal with people who are coming in advocating whatever it is that they're advocating. You know, if I can just do a quick side bar: throughout the day and a half I've been here, I've seen glorious pictures of the Arctic Refuge and I think maybe I've seen 10 seconds of footage of the Arctic in the winter and maybe one picture of musk ox in it in the winter. I wanted to point out a couple of folks: if you're interested in knowing what the Arctic Refuge is like in winter, the Coastal Plain anyway, talk to Pam Miller or Greg Weiler. I think that, individually, they have more experience on the Coastal Plain of the Arctic Refuge than maybe all the room put together, and they can give you some real insight into what that vast landscape is like in January and February. It's another piece of the puzzle, and so I encourage you to talk to them; they have huge experience up in that part of the world.

Greg Siekaniec: Thank you, Glenn. All right, so we're about 12 minutes or so away from when we're supposed to break. I would be remiss if I didn't open this up for some questions from the audience. And lo and behold, I see a hand up already. Is that a question? Okay.

Audience Question: I can't help but notice that there are no women on the stage, and I'm not sure the history of management. So I was wondering first why, and what does it say or mean for leadership opportunities for women, Fish and Wildlife Service. And does it mean that there will be (unclear)?

Greg Siekaniec: All right, so… That can kind of… That's got a lot of depth to it. Richard raised his hand…

Richard Voss: I would only say that I think you're asking the wrong set of people; people hired us into this position, and they're the ones that make the choices of who's going to be at the refuge.

Greg Siekaniec: But there was a question, has there been a female manager, a professional female? Okay, the answer's no.

Richard Voss: Acting when we're gone, deputies, I've had female deputies/managers. There're more females on our staff than there are males right now: permanent, full-time scientists, administrators, pilots, cops. So they have a, you know, maybe they're in a level in the program, working into the system, there's a new… The new deputy to replace the one that replaced his, you know, female. But you could ask those questions of the people on up the line, why there's no female sitting here.

Greg Siekaniec: Jim, did you…?

Jim Kurth: The answer is yes, of course there's impediments because, we started, you know… When Ave started, I don't think there was probably a female hardly at all in the refuge system, so we started with a deficit. And so anytime you're overcoming a history, there are impediments. But the Arctic Refuge had some incredible women working there when I was there, and it's just a matter of time before there'll be one. There've only been five, so we've got the mathematics of a small sample size. But we're struggling in the Fish and Wildlife Service, not just with having more women in leadership, but, more broadly, with the diversity of our workforce. I mean, look around the room; it's not exactly a snapshot of America, our profession isn't yet, and so that's a challenge for us. Greg mentioned this vision process that we're doing, trying to set the course for the Refuge System, and one of the most raucous debates is how do we stay relevant in a changing America that's becoming more urban, more ethnically diverse, that their recreational interests are changing. It's a big challenge for us, and it's one we take seriously, but we haven't cracked the code yet.

Greg Siekaniec: It's a very good question, and I think as you look to the workforce of the Fish and Wildlife Service, we've made significant progress perhaps, particularly in the professional female. I think we're just shy of 50%—47% or so of our workforce in the professional series is comprised of females. Well there, are there opportunities and will there be opportunities in the future? Absolutely. Has it hit in the Arctic Refuge yet? No, obviously it has not, but many other places, I think we're making significant strides. But we certainly do not have an agency, as Jim indicated, that reflects the rest of America. You know, we make little tiny gains and then we slide backwards considerably. I think what we're starting to look at is the educational system producing the individuals that reflect America that we can hire into the professional and/or nonprofessional series for the Fish and Wildlife Service. And there are some significant questions or answers that appear to be that there probably not right now. So, you know, what relationship do we have with universities and perhaps pre-university work to get the interest in the field that we're in by what really reflects America as a whole. So it's a challenge for us, there's no doubt about it.

How about another question?

Greg Siekaniec: Is there a place for volunteers in the National Wildlife Refuge System, and particularly the Arctic Refuge?

Greg Siekaniec: All right. Richard?

Richard Voss: Yes, we have a lively group of Friends in Alaska. We have volunteers who keep on coming back to Arctic Refuge in particular. A lot of our field crews that are on the North Slope in that glorious North Slope summer counting birds, I can't say half, but a lot of our field crews are volunteers. We have volunteer teachers, our traditional knowledge camps that go into the villages have volunteers, I think we… Alaska and Arctic have an active volunteer program. Jen Reed is in charge of it and I can give you her number and we can start the agreement tomorrow.

Greg Siekaniec: Thank you. David?

David/Audience Question: Many… You know, a lot of times when you talk about the refuge and, you know, wilderness sense, and you talk about a place where man, woman, whoever did this was supposed to mean. And when you have this notion of Alaska, many people think people are just transient visitors there, but most are indigenous people that lived on the land for thousands of years. And I wonder if one of the managers could comment perhaps on maybe the evolution of our taking our consciousness and working with the local people and representing fairness and values in developing in the context of management and the refuge.

Greg Siekaniec: Do we have any volunteers on that?

Richard Voss: I'll volunteer. I've had an abiding interest in working with indigenous people across the world my entire career. It's one of the things that brought me to Alaska, to see and work with the villagers. I've taken walks with elders across the Refuge who are connected to 10,000 years of tradition and time in oral history directly; it's not their parents, their parent's parents, they lived life in the realm. And you take walks in an environment with them and you just know that we're experiencing two different worlds that have a connection that the Service and the Refuge has to recognize, we have to work better. And I think we're making headway; whether it's hiring

Refuge Information Technicians or Native Alaskan Park Rangers and Liaisons or Biologists, we're making those leaps and bounds. We have visitor centers in the villages now, we work with YCCs, youth employment programs in Arctic Village, we hope to get something in Kaktovik working from, you know, 15 to 20 kids in the summer times, for them to see us and for us to see them, and hopefully nurture relationships. And that's not just government to government, which we're required to by law, but we should be using each other as sounding boards; whether it's at traditional knowledge workshops or ecological workshops that go across into Canada, we work with those folks, too. No, it's a personal, for me, a personal commitment. But I think it's a Service commitment, too, that we have to do a better job. If the Refuge is going to be here 100 years from now, it's going to be because of the native Alaskans, not in spite of them, and we have to recognize it.

Greg Siekaniec: Thank youm Richard. Does anyone else have a thought they'd like to add to that? Or let's go for another question; Desiree?

Desiree/Audience Question: How do you guys make the Arctic Refuge open to the new vision for the Refuge System, or what role does the Refuge play in changing the vision for the Refuge System?

Greg Siekaniec: All right, anyone in particular feel like taking that? I know Kurth will take this one if no one else will.

Jim Kurth: You know, we're very early into this vision process, and some of you who've been around know we did this in Keystone, Colorado back in the 1990s, and wrote this document called "Fulfilling the Promise," that really gave us a course to follow for a decade. And what we found is that the world has changed, there was nothing in that vision from the '90s that spoke about a changing climate. Nothing in that document that talked about some of the changes we just reflected on, on how the country's becoming more urban and more ethnically diverse and doing different things. And so we thought it was time for us to gather ourselves up and ready ourselves for the next advance that Ira Gabrielson had talked about. That being said, the Arctic Refuge is one bookend of the Refuge System, and I had the good fortune to manage the refuges in Rhode Island and Connecticut; one of them was 40 acres. The incredible importance of the refuges in Rhode Island and Connecticut to the people of Rhode Island and Connecticut amazed me. It was people like John Chaffee and Joe Lieberman and Chris Shea from Connecticut and Rhode Island that were the champions for protecting the Arctic Refuge. So we've got this incredible array of land, from 40-acre tracts where birds nest on the East Coast that are incredibly important, little Sachuest Point Refuge in Rhode Island. It looks across at the mansions of Newport, you've got 10% of the Harlequin Ducks in the Atlantic Coast sitting right there in front of you. So, how do we look at this magnificent system of land that has small islands in urban areas that are so incredibly important to people, to this vast landscape of the Arctic? And now significantly to us, these huge expanses of the ocean that we have: the refuge system now protects the Marianas Trench, It protects not just the Alaska Maritime Archipelago but also the Hawaiian Island Archipelago, equally as large in size and vastly important. So, how do we take this diversity and this magnificent array of lands and bring them into the common framework? I think that for us, it's about assuring that wildlife conservation is our first and foremost goal, and that we also understand that our mission is to do that for the benefit of the American people, and that we need their engagement and their stewardship as part of that. And it is such a challenge to fit that into the context of an enormous place that requires humility and restraint. To the intensively managed wetlands of the Central Valley of California, where we don't manage intensively, you know, the 1% of the remaining wetlands that are there in the Central Valley that we manage supports the entire Pacific flyway. So it's, you know, you weigh in and you folks help us to discern that. There's a wonderful website that the refuge association is running for us, it's americaswildlife.org that'll allow you to join in, in a social network environment, and help us inform this vision process.

Greg Siekaniec: Thank you Jim, thank you for that lead Desiree.

Audience Input/Question: I'd like to follow up on that; I'm Chuck and in the early 1980s, the Carter Administration, there was a wildlife refuge task force which I had the great honor to be a member of, which was to update from the Leopold task force of 20 years earlier. One of the things that we put in that report was to promote, to the reasonable extent, wilderness management, but beyond that, to manage with naturalness, with a light hand. And I must say that I don't think the Fish and Wildlife Service has ever moved around to do that, and I've been in many refuges where there's manipulation. But I don't think that there's been a philosophy that has come into the whole workforce of doing the sort of minimum kind of manipulation, and I frankly am very disappointed in that. And it raises questions like why should the Arctic Wildlife Refuge continue to be managed by an agency, which is primarily manipulation-oriented? As opposed to the Park Service, which is now into the wilderness kind of ethic. And I really think it's something that the agency seriously needs to address and to move forward on.

Greg Siekaniec: Thank you for your comment Chuck, and that is certainly a dialog that we engage in often within managers, within the Fish and Wildlife Service, within the Refuge System in particular.

I believe, Steve, we are probably out of time. Thank you audience for being participatory, and let's give a round of applause to our managers up here.

Sarah James: "An Alaska Native's Perspective on Arctic National Wildlife Refuge"

So many Americans so far came forward and made a call to Congress to protect the Arctic Refuge. Repeatedly, they have spoken loud and clear to protect the Refuge since 1988. We went through many battles, and it was loud and clear: Americans wanted it closed to gas and oil development, and to protect it. I was talking to the University of Alaska students; I talked for three hours, and they said, "Can you give us three more hours?" The same bunch came back for another three hours, they like it so much. So, we still need to make more friends, to keep these friends, they're very important to us, as the Gwich'in people, and to make more friends.

I don't have any kind of degree except high school. I would say my degree is listening to elders, watching my mom and dad work, and living the life; that's a good teaching. But we also know as the Gwich'in Nation that our children have to live in these two worlds; we can't go back to bow and arrow, and we can't be somebody we're not, so we get caught in between. So, we have to use good tools from this side and the other side and try to go forward. That's been my life, and we need to do that together.

My name is Sarah James. I'm 67 years old. I grew up on the land with my parents. My parents never had a job that paid them. So, that's how I grew up. I grew up along the Yukon River, and for Yukon, Alaska, I grew up on the Salmon River, trapping and hunting; just us family living out there 50 miles from the nearest neighbor. We live in Arctic Village and hunt and fish all the way around the village to survive. That's how I grew up.

It was alarming and awakening back in 1988, for our elders, for our people, because that was a threat to our nation as Gwich'in Nation. They were talking about gas and oil development of the Arctic National Wildlife Refuge, the Coastal Plain of the Arctic National Wildlife Refuge. We didn't know where to turn but turn to our elders and all of our leaders. Some of our leaders went to all the Gwich'in villages, 15 of them, in the U.S. and Canada; we're one nation of people, but there is a Canadian-U.S. border between us. It's almost 150 years we've been separated by the border. But they went to all the villages, talked to the elders, and the elder (Myra Kaye) suggest that we have to gather to discuss the threat to our nation. They said that's what they did before, when they were nomadic people. I see in my bio-set I was nomadic, but nomadic then was maybe my three grandmas ago. So, they came to the elders, and the elders said we have to come together,

USFWS/Cara Schildtknecht

Sarah James

and we came together June 5 to 11 in Arctic Village. It was like a rebirth of the nation: we find our relatives, we have stories, it was very exciting. But the elders took over the meeting, they threw away the written agenda: "This was not how we did it then. We're going to do it in our terms." And the leaders got concerned, they said, "This is good, this is really good, what's happening?" They said, "Unless it's in black and white, the world will hear about it. Other than that, the world will not hear about it." So they separated themselves from the meeting and

they went and held beside somebody's house. Around a campfire, they wrote a resolution to protect the Coastal Plain of the Arctic National Wildlife, the birthplace of the Porcupine caribou and the Gwich'in way of life, and they took it back to the meeting. They even argued with the elders, saying, "We had to do it that way." They finally convinced the elders, and they passed it. But the elders, they said, "We have to give… this is one resolution we're going to protect as a Nation, and that's to protect the Coastal Plain of the Arctic National Wildlife Refuge, to protect the birthplace of the Porcupine caribou, and the Gwich'in way of life." And then they said, "We have to choose three from Canada and three from Alaska to make it work, this resolution." So they did, and I was one of them from… Four, four from Canada and four from the U.S., and I was one of them that got chosen that time. And that's how they formed Gwich'in Steering Committee to speak on behalf of the Gwich'in Nation.

It's been a long struggle to try and make it work, and then they said, the elders said, "We're going to give you direction, we are to do it in a good way." We had to do it in a good way to educate the world why we say no to oil. In those days it was… they were concerned that there're changes going on, they are changing. They know, they know about global warming. Norma Kassi talked about global warming at that meeting; she's from Canada, a pretty well spoken person. And global warming climate change, they were talking about that. For all that reason, they said we had to do it in a good way, and a lot of people we know will bring the traffic. Nobody knew about Gwich'in then because we kind of were the last ones to be called, the last ones to be contacted by the so-called "Columbus discovery," because they came in from the Arctic… for whalers came in that way, and up the Yukon trappers came, and we were kind of caught in between. So really, nobody knows about us. And they said, "How can we do it? Nobody knows about us, the world is huge, it'll bring the people." That's another threat they were thinking about; that's why they said they had to do it in a good way, to teach in a good way. And they also said no compromise. They also… the threat of traffic, and they know they cannot do it by themselves, we have to educate and share our knowledge, make friends. That's the only way we can do it, because it's too huge. Oil is a multi-million-dollar corporation and we don't have anything. And then they said since nobody knew about it, we went to the press first, we had to do the press first. We went and educated the press, we found a way to talk to the press, and that really helped at the beginning. The one thing that really helped us out is 1989; it's a bad thing that happened in Mexico, but that oil spill in Prince William Sound gave us time to organize.

Since then we meet every two years to renew that resolution, and we've been doing that. Just this year, we went to Fort Yukon and had a big gathering and we renewed that same resolution. And the next one will be Fort McPherson, Northwest Territory, and everybody is welcome; we like people to come and learn about the Gwich'in and be with our people.

We also believe we've always been there, that the creator put us there to take care of that part of the world. We didn't come from anywhere, we're not going anywhere, we're here to stay. Like these places here; I imagine this being Junjik River. We have this berry hill that's something like that in Junjik River, we call it a berry hill. The berry there is a medicine for diarrhea or to clean us out, we have that hill, and the leaves are very slippery; you can slide down on these things. And then I remember, I like… I thought this was Junjik for a while, but it's the Salmon River. Right around here, maybe, my father shot sheep, and then in Junjik, we have a hill like that here to, and we called this (ju), that means forest, one tree, and then a lot of (ju's), a lot of trees. And we have names and places from way back, and stories that we tell about our country. And then we tell… there's berries there, there's fish there, there's ducks there, it's our meal there. And when we look at it, we don't think about how far we're going to climb, we only… Like, one young girl came to Arctic Village one time and said, "I'd like to climb that mountain, it's so beautiful." And all those guys looked at her, finally one guy said, "What you want to go up this for? There's no food up there!" So, it's like that with us.

To us it's a human right because we've always been there, but to a lot of people it's public interest right, public interest land. Which is okay, but we have to help each other to make it real. Just like caribou is like buffalo to us, just like it is to the Plains Indians. We call the Coastal Plain of the Arctic National Wildlife Refuge *Iizhik Gwats'an Gwandaii Goodlit*; that means *Sacred Place Where the Life Begins*. It's a birthplace for many birds, polar bears, bears, all kinds of, you know, we've been hearing that for how many days now? How wealthy it is. We look at the wealth of birthplace, we believe that birthplace should be protected. This, like I said, this would be Junjik and we have a place in Junjik where fish gather. We really don't even talk about it to anybody because we're not supposed to disturb that place. There are some places in our land that're very sacred to us, just like this Coastal Plain is to us for the caribou, because they've got no other safe place to go. And caribou is everything to us, it's our clothing and it's our food: maybe 75% of our diet is still wild meat. It's our shelter: we still live in caribou skin huts. That's how we survive today; we are under that.

The birthplace, when life is formed is like a woman. Us women should really support this because it's a birthplace. Because as a woman, we give life; that's the most powerful thing there is to anyone, and we're pretty powerful. As a woman, that's how we understand it, because we gave life. And when you're talking about birthplace, that's sacred. Because when I had my child, I like to have it where it's clean, where it's quiet, and where it's private; that goes for any living. So we can be strong on this as a woman. You know, when I first got chosen to speak on this issue, my people didn't tell me, "Don't go out there as a woman." They said, "Go out there and educate the world in a good way." But, you know, we know our role as a woman, that we should respect places like that, and also a man, because I wouldn't even be here if it wasn't for my father. So it takes two to help, to shape that life. And that's what birthplace is. It's also our voter issue; we're working on free passage.

A story: when I was growing up, I was wearing caribou hair parka with a hood and no buttons; just over, you know, slid over, and the pants, the hair inside, the boots, the pants, one shot. Well anyway, in those days it used to get 70-below. We haven't seen 70-below for a long time; it used to be something we'd get every year. And I would be out there playing in the snow all day. That's my favorite pastime, because I don't have to work, and then we'd slide down with it. I got a brand new parka one time, a brand new caribou parka. And that's the best sled, you can go down like this, you can go back, have a lot of fun, but it wears it out faster. So, one day, my mom said, "Boy, you've been a good girl, I'll put a tassel on you, you've been a good girl, I'll decorate you up." And she put these tassels, you had to earn these things, you had to earn these things. I think they do that so you don't slide down in your…!

And one time we were without food, again, I'm out there and we don't have anything to eat, very little to eat. You know, even then, when I was growing up, we combined western food and traditional food. That's how we survive out there. Sugar, white flour, white rice, white macaroni, and what we can get to combine. But when we were out of food, we were out of western food, and so we had to eat meat and broth, fish and broth, and cooked on the fire because there's no grease, all that stuff. And after awhile I feel good, I start taste, taste good, hair good, I feel healthy. I think there's just too much other stuff that's making it bad for us; that's what I'm getting at, I learned that. I still like meat and broth sometime because it's good for you.

In our decoration, you see the flower in the back of my hair, flower on my shoe… I mean, my moccasin. We do floral decoration because maybe we get flowers less than three months a year; the rest of the time, we enjoy it by having a decoration on our traditional clothes. My sister made this invitation style that we use; men and women almost dress the same, except today I'm wearing a skirt. It's like this, in one line and pointed. The Indians with the pointed fringes are us; the Indians describe us that way to other Indians; with a long tail or something. So, this brown one, we don't color it; we smoke it, make it smell like smoke. A finished product is white, white skin. It has to be the most white, like mom's tanning, with the softness to it; it's a brisk tanner. And the white one usually is for winter, because it camouflages with snow. And then they smoke it with… I used to go out and collect decayed wood with my mother, and my mom mixed decayed wood together and looked at the color that she wanted, and then she'd sew that skin together and smoke it and it would come out that color, and it camouflaged with summer. You see all these fringes on there, American Indian clothing, or Davy Crockett, or Daniel Boone, I think they've overdone themselves! Well, anyway, it's to keep the mosquitoes away. They used to have it over the children's faces; they still can see but the smell from the smoke would come out and keep the mosquito away. This is what this all about right here, and all of this decoration right here: it works like sunglasses; it just works. Because I was really marching down at Cancun last month, and it was 100 degrees, I don't know—hot! But this worked like sunglasses and a sweatband! So, you know, it really helped. And this one gave me breeze. So we dressed to survive, that's what I'm talking about. Even the kids have it over the face and all that stuff; that's how we survive, we dress to survive.

This "do it in a good way" didn't come about in 1988, maybe; it goes way back even before, during the nomadic time. Because when those guys have to go out hunting, or to go out just to dance, or for war, or even when somebody passes away, they paint their face this way. The reason they use that paint was to go in the good way, with good mind, you know, the five senses and the body, to go that way, in a good way. Good mind, good sight, good smell, good taste, the whole body. And that's why we paint our faces: the guys paint their face that way, even just to go to war, he had to do it in a good way, you know, to survive.

We like people to come and learn about us, and we want to learn more, too. And we have learned lots because we seem to… we've gained some friends to prove it. Back when we were nomadic people, we were clean, we were well organized, there were lots of us, and the only thing that our people used to die of was old age. That's how we survived in those days. And all of our song is prayer, and we dance to it, and we sing this to welcome, you know; indigenous people, or the Indian people, are generous to welcome you, and always have been. And I guess that's what makes us feel very special that way.

When I was in Cancun, I did some international work; it's too hard and complicated, even worse than working with Congress, educating the Congress! Well, anyway, one of my friends came up and said, "Oh you're a new blood." I said, "No, I'm not a new blood, my blood's here for many generations."

Raven is sacred to us; we honor raven because, when the creator made him, he said, "Okay, you go now, but you're not going to prey on other animal for food, you're going to keep the earth clean. You're going to live off of leftovers." And I think we're leaving too much trash. Well, anyway, that was his responsibility, and for that reason, we honor raven, and we sing and dance the raven song to keep the earth clean. When we dance, we dance clockwise, imitating a raven. And then this hunter who shot a caribou—that would be the person right in the middle—he couldn't carry the whole caribou back to his camp or village, wherever, so he left some. While he was gone, the ravens were eating on it; when he came back, the ravens all flew away. And when he picked up the rest of the meat that he had, whatever was left over, they came rushing back to finish it. And that's what we dance.

Raven is like many stories we've got: it was a lesson, a legendary story. He always outsmarts people because, you know, right now I think he outsmarts us by trying to keep clean, but we overdid it. Well, anyway, I used to get really mad: how stupid can these people be? And I used to get mad when my mom would tell us the story about it. We've got lots of different stories about raven. One story: they finally caught him and they said, "What are we going to do with him? What are we going to do with him?" And they didn't know what to do with him. So the raven said, "I know what you guys could do with me! Make me a big swing and build a big fire and swing me and swing me and throw me into the fire. That's what you should do." So, the people made the big swing and they made the big fire, and they swung him and they threw him in the fire, but he flew away!

It's fun to dance, that, it just goes on and on and on. They imitate raven and we dance.

I've got a few tundra teas out there and I just only ask for donation. This thing really helps in educating our people, because it's done by Fish and Game, and helps all the birds that fly from each state. But we have stuff like that from getting together and helping each other. These really, really do work.

We had to come up with a lot of good media attention together. I think we can get a lot of friends that way. And we did this at Fort Yukon for salmon protection and caribou protection, (we put our body down aerial arch). And we also did one in Arctic Village, I've got a few of this one out there too. And on there is a website, gwichinsteeringcommittee.com, we've got a lot of material that can help us to do our work, and we do receive donations. And this is for the 50-year anniversary, I think we did it, I don't know. Well anyway, I just thought I would let you know about these things.

So, back to finishing, like Roger said, wilderness; we've been talking about wilderness. To us Gwich'in people, it's hard to define wilderness. We have to go to village and ask the elders, because to us it means it's there to be tamed or something. So finally, we said, "How did they see us when they got here? The first visitor." We call them [unclear], the first people that came to our area we called them [unclear]. Well, anyway, they saw us in there as a wilderness, and they've got to conquer it, which most of them did, except the Refuge, the Arctic National Wildlife Refuge. So, we want that as a wilderness, so we have to explain all that to Gwich'in elders. Finally, we came up with a definition that leave it the way the creator made it, and that's wilderness to us as Gwich'in people.

So, even when we were nomadic people, we used to do caribou fence, and we built a big, portable fence that's shaped like that. We could open and close it, and the caribou would come in, and then they'd close it up. When they have to go out there, so that they won't leave the scent behind, all they do is rub their foot in the ashes; that's acid and doesn't leave scents behind. So, that's how careful they were. And then when they leave a camp or something, they throw all the bones in the river, the lake, the creek, because they wouldn't leave scents behind, but it's also good for fish. Then, they go around and brush all the scent away before they move on, so we don't leave evidence behind. So, even when I was growing up, my mom, when we'd stop over for a camp, or something for lunch, usually we'd need a stick to cook our food, and she'd say, "You go out and you get one, but don't try but three, four, or five." That's how careful she was. So, like that, and I guess that's why, like I said earlier, we were pretty healthy.

So, we really need something that will be concrete for the wilderness protection of the Coastal Plain of the Arctic National Wildlife Refuge, for all those reasons.

And I think, you know, we have to deal with the tribes and the corporations, and we have to deal with the State of Alaska, oil companies. Corporations: there're business ventures, there're native corporations. They're not a tribe; there're 200-something tribes in Alaska, and we do have a vote from them, from the Alaska Intertribal Council, but we don't have a vote from the Native Corporation, so those are totally different. And we have a resolution with the Nationwide Tribe. If we don't, the Congress won't even talk to us, so we have to keep that all the time, too.

So, there's a lot of work to it, we need… I just need help, help! And then, like I said earlier, there are a couple of interests of land, which is very good. And I can have an interest, a public interest land, too, and also still work on the human rights. But my issue is human rights, and I speak for myself, which is working very good, but, you know, it's… I went to a refuge meeting one time, was the only one there for subsistence, and there's a big recreation reason, there's a big hunting reason and all of that, but there was very little subsistence. We need to fix that. We need to balance that. We need a lot of balancing, too, in order to protect the special place that we've been talking about, because this is a huge refuge. At Fish and Wildlife, I think we are beginning to work a lot more, and we need a lot more togetherness with the local people. I think they also need help, because they're understaffed and this thing is huge, there's one or two people patrolling the whole place. Maybe we can help each other doing so. And we need a refuge center; we'd like to have a center in Arctic Village, to teach more people about it as they come in. I mean a real place, not a little stopover place. I think we can do that.

You know, the way my brother explained the refuge to me originally, it was supposed to be combined with the local people, which would make me a co-manager. So let's make it work.

Exchange: we can bring our leaders here, and see, and learn more about the Fish and Wildlife, and bring our leaders to a lot of these public interest people to learn more about each other, to protect.

We need to do, you know, more wind energy, solar energy, small hydro, all of that. Recycle, reuse, reduce, and refuse. Rediscover to survive, to reassure ourselves.

Lowell Sumner

Joe Creek caribou

Dr. Robert Krear:
Film: Letter from the Brooks Range

Bob Krear, Brina Kessel, Mardy Murie, Olaus Murie, Don McLeod in Arctic (1956).

I've been widely traveled in my life and have seen much, but I think my best experience was the two months spent in the Sheenjek Valley with the most compatible group of people I could have asked for; it was just like a family.

Mardy Murie, who has had many great experiences with Olaus in Alaska, was once asked what her favorite experience was, and she said, without any hesitation, "The Sheenjek, the Sheenjek." And we could see that, that relationship with Olaus that summer was wonderful.

In 1952, when I was a graduate student at the University of Wyoming, I picked up a magazine, "Pacific Discovery," and was immediately attracted to the story of fur seal research in the Pribilof Islands. In just a few months I would complete my master's degree in wildlife ecology, and I was looking for jobs that would give me field experience; the summer in the Pribilofs, and especially back north, would be wonderful. I applied immediately to Dr. Victor Scheffer, then the head of the marine mammal research, for the summer position of biologist assistant. Shortly afterwards, I visited Olaus and Mardy in Jackson Hole. I'd met them 5 years previously and had become like one of the family. I remember telling Olaus of my hopes for the summer position, and I can still remember the words to Mardy, his words, which were, "Mardy, you know Bob wants to spend the summer in the middle of the Bering Sea studying fur seals?" I could see that he was pleased. What I did not know until months afterwards was that Olaus immediately wrote a letter of recommendation on my behalf to Vic Scheffer. Olaus and Vic had worked together on the fauna survey of the Aleutian Islands and Alaska Peninsula during the years from 1936 to '38, and they were very close friends.

I got the job, and I was teamed up with biologist Ford Wilke. Ford and I hit it off great. That summer and fall turned out to be everything I had hoped for, even though working on the fur seal rookeries was one of the dirtiest and smelliest jobs I've ever been exposed to.

In 1956, I again applied for another research position on the Pribilofs and got it. Well, then what happens? After I committed to Fish and Wildlife, Mardy Murie phoned and said, "Bob, Olaus and I want you to join us on our Alaskan Brooks Range Expedition this coming summer. Can you do it?" I'm sure you professionals sitting in the office can see the quandary I was in. I knew that Olaus had recently been released from the hospital, and I also knew that I would do anything for Olaus and Mardy; they had become like foster parents to me. I thought for only a few seconds and then I told Mardy yes. I told her of my problem and that I would resolve it somehow. I've never known for sure, but I suspect

Mardy also wrote to Dr. Scheffer. When I resigned my position with Dr. Scheffer, I explained the situation, being almost certain he would understand. At the same time, I suggested another man for my replacement, and he was hired and did a fine job. In fact, in subsequent years two other young men, students of mine that I recommended, were hired, and they were also excellent. In 1957 I again was hired by Dr. Scheffer as a research assistant for what started out to be to a 3-month appointment on the sea otter project on the island of Amchitka in the western Aleutian Islands. I guess I was forgiven, because I was hired. And out there, incidentally, I worked under the one man who disagreed with my decision in 1956, but he even promoted me while I was out there, so I guess he forgave me also.

It was sort of necessary to save that pristine Arctic wilderness; it's pretty obvious actually. Once it had been decided, Olaus Murie, the director of the Wilderness Society, was selected and asked to select an area up there that could be extensively surveyed ecologically. In '53, Olaus flew over the general area and selected from the air the beautiful Sheenjek Valley. It turned out to be a great choice. The expedition members were Olaus and Mardy Murie, Dr. Brina Kessel of the University of Alaska, another graduate student named George Schaller, and me. Then, I was a 6-foot man, 185 pounds, very strong, a war veteran of the only Alpine Infantry Division in the United States, and a lifelong woodsman of subarctic and Pribilof experiences.

Years later Mardy told a colleague of mine that my presence on the expedition made it possible for Olaus to be there, the reason being that Olaus had just recovered from what had formerly been a fatal disease known as Miliary tuberculosis. I've also heard it named as meningitis of the brain. Mardy did not want that summer in the Sheenjek to be in the least bit physically stressful for Olaus.

Although I'd be digressing a bit, I think it might be interesting to all present to hear how two animals in Africa saved the life of Olaus Murie and made it possible for him to create and lead the expedition. It's one of the most fascinating stories I've ever encountered as a biologist and mammalogist. These animals are a bird, often called the honey guide, and a large mammal of the weasel family known as a ratel or a honey badger. According to the native Africans, the honey guide leads or guides the badger to its source of honey, where the badger excavates the honeycomb. The badger wants the honey, but the bird wants the wax, which it can digest and from which it obtains energy; within its digestive juices there's an enzyme that can metabolize wax. Well, the bacteria that were killing Dr. Murie were covered by a waxy covering that rendered them immune to any known antibiotic. When the medical profession learned about the bird and the enzyme, they synthesized the enzyme and combined it with an appropriate antibiotic, and this was used to save Dr. Murie's life. There can't be any better example of why it is so very important to preserve wilderness and the animals and plants that share such environments with us.

I don't know if all of this is true, but the bird does exist, and it does eat beeswax. Just like the ravens that follow wolves, perhaps they just follow the badger, hoping it will find the honeycomb. Well, maybe we're seeing a reversal in relationships here; maybe the badger, being one of the most intelligent of the weasels, just learned to follow the birds, or maybe this all happens just by pure chance.

Alright, to get to the expedition: about mid-May the Muries and I traveled by train from Rock Springs, Wyoming to Seattle, and from there we flew to Fairbanks. Almost all of our equipment had preceded us and was waiting upon our arrival. There Brina Kessel and George Schaller joined the expedition. Mardy and I sat down and tried to determine what food we were going to need for the entire summer, and we did a surprisingly good job; we'd both had some experience. There were deficiencies, but our Bush pilot, Keith Harrington, was to drop by every two weeks and would bring any additional things we needed. There was one thing, one item that Olaus and Mardy both wanted, and that was a Yukon stove, which they had used many years before. We were finally able to find one in the Northern Commercial Company warehouse in Fort Yukon, and we made frequent use of that on the Sheenjek. In fact, I remember making a large loaf of Logan bread for George Schaller once for one of his very frequent long-distance treks.

The Muries had many friends in Fairbanks, which resulted in about two weeks of social events before we could leave for the north, but finally we were ready to go. Olaus said we could take George and fly up to the Sheenjek Valley and locate and establish our first camp, which we did with the help of Keith Harrington, our Bush pilot. After checking out a few spots in the northern end of the valley we decided to land on a frozen lake around the middle of the valley. There was a bench about 10-foot high on the lake's north side where we could put our tents. Keith landed on the ice, offloaded us and our gear, and returned to Fort Yukon. George and I set up camp, and Olaus, Mardy, and Brina came in the next morning with the rest of our gear. Everyone was eager to explore the valley.

We found ourselves in a paradise something like 170 miles north of the Arctic Circle. A few hundred yards to the west of the camp was the Sheenjek River; on the flats on the other side were two nearly-grown sibling barren-ground grizzlies, wresting and apparently having fun. There was also a small group of caribou that the bears would chase, just for the fun of it, we thought, because they couldn't catch them. Willow ptarmigan were everywhere; it was obvious we had arrived about the height of the breeding season, as the males were very vocal, as were many other birds. There was a 10-foot moat of water at our end of the lake, and in the water there were already ducks and muskrats active. We had come in about the last day of May and just after the last snowfall, and the weather was great, as it would be most of the summer.

Brina was the University of Alaska's foremost ornithologist, and she and George would be studying birds most of

the summer. Olaus, of course, would be interested in everything, but his special project was carrying out a food habit study of wolves, so we were all interested in collecting wolf scats for him wherever we found them. I was sort of the official cinematographer, and the movie footage I obtained ended up in two commercial films. Mardy was always the assistant and companion, as she had been all of her life, as well as the main camp cook. What we mainly did was roam the valley and the two mountain edges that flanked the valley, each doing our own thing, so to speak, and recording our observations.

We had the following very interesting wildlife experiences: A wolf walked into our camp one day, and, not knowing I was there, walked up behind me where I was sitting at the edge of the lake watching some muskrats. I'd just completed a study of muskrats at the University of Wyoming. The other camp members were in their tents, taking a nap, I guess. Hearing a slight noise behind me, I turned my head and looked into the beautiful eyes of an arctic wolf standing 10 feet away. We both calmly eyeballed each other for a few seconds, and then it turned and slowly walked away. It didn't run; it walked away with considerable dignity, back the way it had come. When it got out of sight around the bank, it broke into a lope and trotted across the lake ice. I quickly called the others from their tents, and they saw it. George Schaller was to see another wolf up near the crest of the Brooks Range on one of his treks, but I don't remember any of the rest of us ever seeing another wolf, although we did hear them occasionally.

One day, Schaller spotted a gyrfalcon's nest up on the abrupt cliff face of the mountain across the river. He and I climbed up to it and, by traversing a narrow ledge, got to the nest and found three almost-fully-feathered young birds. We got some fine still photos, and a day later I got movie footage of them. Traversing the narrow ledge to get to the nest was probably something we should not have done, but we both considered it non-technical, and we both had climbing experience.

The most exciting, and perhaps dangerous, experiences of the summer occurred when we were charged twice by barren-ground grizzlies. The first incident occurred to me after leaving Schaller at the gyrfalcon nest. I am going to describe this encounter, because it was probably the most exciting thing that happened the whole summer, to me at least.

I had made arrangements to climb the next mountain to the north with Olaus Murie and our visitor Don McLeod, who was his personal physician, and I knew they would be waiting for me somewhere on that mountain. So I climbed to the top of that first mountain, was walking north on the connecting ridge, when I topped a valley coming up from the east. I immediately spotted a grizzly sleeping on the slope about 200 yards below me. I wondered where Olaus and Don were and, with my binoculars, quickly located them at the bottom of that valley, waving at me, I assume to alert me to the presence of the bear. But photography was first on my mind. As I analyzed the situation, the wind was in my favor. I could get close enough to the bear to get my picture; about the same time I got upwind of the bear, I would give it my scent, and my plans were to chase it down the valley toward Don and Olaus so they could get pictures. Well, it did not work out that way.

Before I could put my plan into operation, the bear awakened, sat up, looked around, and spotted me up above it on the top of the ridge. I knew at that moment that photography was out, and I had to get the bear in my scent, and I started to walk in the direction that would accomplish that. When I started to walk, the bear started to walk rather rapidly toward me, and, for the first time, my sense really became alerted; I knew I had a serious problem. I quickened my pace to get upwind, and the bear started to run to cut me off, and I could see it was going to do it.

I remember thinking to myself, "If the bear gets close, Bob, this bear might even kill you, and it's not going to be an easy way to go." I stripped the pack away from around my back and was going to smash the bear in the face with it, thinking, I guess, that would give it my scent if anything would. Then, about 10 to 15 feet away, it got directly downwind of me, got my scent full on its face, and you've never seen a more startled animal in your life. It slinked toward me on all fours, splashing me with water and small rocks from a small rivulet draining the slope to my right. It spun around a couple of times, letting out an explosive "whoosh," then galloped away at high speed down the valley toward my friends, just as I had planned it! I dropped the pack board, whipped out my camera, and got the picture, which turned out to be blurred. I think it was mainly the bear; he was moving fast. It might have been the first time that bear had ever encountered the scent of a human being, and of a man that hadn't had a bath since leaving Fairbanks. This was a very quiet encounter; I hadn't even thought of yelling at the bear, and I certainly had not thought of lying down and rolling up in a ball.

I watched the bear as it ran down the floor of the Sheenjek Valley, where it kept running until it was just a small speck in the distance. I then walked down to my friends, and, to my surprise, they had missed the whole charge; in order to get into a better position for photographing the bear, they had been moving when the bear charged me, but the bear did pass them. I couldn't believe it, but they didn't get any pictures. But I had quite a story to tell them.

The second bear encounter was when Kessel, Schaller, and I were hiking up the Sheenjek Valley. We had entered the dense spruce forest after first penetrating some dense willow growth and were immediately charged by a grizzly, whose sleep we had interrupted. I was leading the group and it singled me out. George and I both yelled at it and it ran away. I remembered this time to make noise, but it had gotten within 10 feet of me. I looked for George and Brina, but they were nowhere to be seen; they had dived backed out through the willows, leaving me to do battle alone! But I'd have done the same thing in their

position. After the second encounter, I was spooked, and I was very bear-conscious all the rest of the summer.

In early summer, many small groups of caribou passed our camp, many on the lake ice in front of the camp and heading for the high passes over the Brooks Range through the Arctic Slope to their critical breeding area that is now known as the 1002 Area—the area that would be destroyed if there were any oil exploration up there. There were quite a few weeks we did not see any caribou in our valley, but on July 15th, they came back from the north by the thousands. After supper that night, we heard a strange roaring sound north of camp which mystified even Olaus, but which turned out to be the herds crossing the river. They moved across the valley to the east almost at a trot on their way to the valley of the Colleen River and on to the forests of Canada, where they would spend the winter. For several days, more came through and then they were gone; for the rest of the summer, we saw only a few stragglers.

August 15th was our last day in the valley. We had been there 67 wonderful days, but now it was the transition time between summer and autumn, and the weather was changing: rains were falling, and there were now new permanent snows visible on the peaks of the Brooks Range. The ground underfoot was getting saturated, and we had to leave. Kessel and Schaller had to get back to their university, I was beginning my doctoral program at the University of Colorado, and Olaus had reports to write about the expedition.

He lectured many times to many groups, emphasizing the importance of preserving that wilderness area. The Senators and Representatives of Alaska, of course, killed a congressional bill, but, as you know, Secretary Seaton established it by administrative order.

For those who asked how I got to know the Muries, I'd like to explain, as they contributed much to my life. I was a forestry student at Penn State University during the academic year of 1942 to '43, as well as a member of the University ski team. In September of '42, I had to enlist in the service, in the Reserve Corp, in order to be assured the entire freshman year of study at Penn State. When I was inducted into active service in May of '43, along with thousands of other skiers from many universities, I volunteered to begin training with the 10th Mountain Infantry Division high in the mountains of Colorado. It was there that I met Martin Murie, the first member of the Murie family that I had met, and a good friend of his named Harold Hagen from Jackson, Wyoming. In the spring of 1948, when I was passing through Jackson's Hole en route to a summer position with the Forest Service in the Northwest, I was introduced to Mardy Murie by Harold Hagen. In 1949, I began graduate work at the University of Wyoming, and from then on the Murie home became my second home.

In 1951, I was field assistant to a McGill University doctoral candidate and his ecological research in the northern subarctic Ungava Peninsula, the landmass on the eastern side of Hudson Bay. We were in Northern Labrador, the same country that Olaus had passed through in 1917, when he was a member of the Carnegie Museum Expedition that had traversed from south to north by canoe the entire length of Ungava Peninsula, up to Fort Chimo and Ungava Bay. My friend and I were on Lake Menihek, and we learned that the rapid entering the lake was named Murie Rapid. When I told Olaus this on my return to Wyoming, he was not pleased; Olaus believed very strongly that natural areas should not be named after people.

When our Sheenjek visitors, Justice William O. Douglas and his wife Mercy, were sitting around the campfire with us once, the same topic came up and Bill Douglas strongly agreed with Olaus. In fact, there was once a movement to name the Arctic Refuge after Justice Douglas; he would not have liked that.

In 1942, I applied for ranger naturalist position in Grand Tetons National Park. Olaus submitted a recommendation on my behalf to the chief naturalist stating the expedition experience, as well as my forestry degree and mountaineering and military experience, as highly qualifying experience. That led to 15 years of highly satisfying service as a seasonal professional naturalist in the National Park Service at eight different national parks.

I mentioned already that in 1953, it was Olaus's strong letter of recommendation to Dr. Scheffer that assured me of being granted that summer that first seal position on the Pribilof's. But I consider the crowning achievement of my professional career as being Olaus and Mardy Murie's invitation to join the '56 Murie Brooks Range Expedition for that entire summer.

Again, I'm sure it was Olaus's influence that assured me of being granted the fascinating appointment of sea otter research on Amchitka Island. But following all of this experience, I had no difficulty being accepted for candidacy for the doctoral program in biology at University of Colorado in 1956, thanks in particular to the Muries. I received my doctorate in '65, and spent the remainder of my professional career teaching for 19 years at four universities.

Finally, I cannot help referring to the poem by Robert Frost titled "The Road Not Taken" in which he mentions the traveler encountering two diverging roads in a yellow wood, and, not being certain which road to take, choosing the one least traveled, which "made all the difference."

It was 62 years ago I met the Muries, and they had made all the difference in my life.

Ed Zahniser: "The Preservers Are the Ones Who Deserve the Ink"

Like Dave Brower observed, you never win. You get a reprieve. I would like to share with you an ironic parable of what could befall America's protected natural areas without good friendship and advocacy, and without systems of land protection like national wildlife refuges, national conservation lands, and designated wilderness areas.

Richard Brautigan's novel *Trout Fishing in America* laments the loss of the American dream of wild nature. In its chapter titled the "Cleveland Wrecking Yard," the novel's protagonist has heard that a used trout stream is for sale, so he visits the junkyard, where a big sign announces:

USED TROUT STREAM FOR SALE.
MUST BE SEEN TO BE
APPRECIATED.

They sell it by the foot. A man bought over 500 feet for his niece's birthday earlier in the week. The waterfalls are stored in plumbing, where toilets are stacked up five-high. Waterfalls, glowing beneath a skylight, cost $19 a foot. The used trout stream, out back, comes from Colorado. The novel's protagonist asks how much the trout cost.

"They come with the stream," the junkyard proprietor says. "Of course, it's all luck. You never know how many you're going to get, or how big they are. . . ."

Used trout streams sold by the foot at the junkyard—or the Arctic National Wildlife Refuge? Thank goodness so many forward-thinking people wouldn't take "no" for an answer in their struggle to protect this magnificent land, the Arctic National Wildlife Refuge. Today's symposium theme is place, but I must confess that for me this great and special place—Arctic Refuge—is inextricably entwined with the persons of Olaus and Mardy Murie. But to talk of the Muries on this day is not to imply they labored alone. Saving the Arctic Refuge has been the work of a cast of characters; for the full story, read Roger Kaye's book "Last Great Wilderness," the comprehensive history of the Arctic Refuge up to 1960.

My first time with Olaus and Mardy was not 1961 in the Sheenjek. In 1947—I was 16 months old—my family summered at the Murie Ranch, the old STS Ranch in Moose, Wyoming. My only memory of that summer is a memory in a photo. I kept stealing my older sister Karen's baby carriage and my father caught me on film in evidence.

Olaus and/or Mardy were often at our home in Hyattsville, Maryland when I was young, and our family spent the summer of 1953 in Ade and Louise's cabin on the ranch. We were there more briefly in 1956 with the Brower family for a Sierra Club trip in the Teton backcountry and Alaska Basin—probably my mother Alice Zahniser's favorite place on this planet. I also spent time with Mardy in Moose in 1982 as I worked on the Grand Teton handbook for the National Park Service, hoping against hope that Mardy would agree to write its introduction.

In 1993, my wife Christine and I, with our two sons, stayed in Chena Cabin on the Murie Ranch. One afternoon, from the back window in the Muries' living room, Mardy and our family watched a moose eating a shrub right on the other side of the window pane. "I've never been this close to a moose!" Mardy said. If you look at the model of the Murie home in Moose, Wyoming in the entry building here at the National Conservation Training Center, you can see the bush that moose munched. We had a dentist's-eye view of its teeth. There was no YouTube then.

My wife Christine Duewel, my National Park Service colleague Susan Barkus, and I took part in the premature 100th birthday symposium for Mardy at the Murie Ranch in Moose in July 2000. So did the late Celia Hunter, Bob Krear, Mark Madison, Steve Chase, and Ryan Hagerty. That was a grand event in a tent canopy pitched not far from where my siblings and I rode the tops of aspen saplings in wind storms, before we knew for sure who John Muir was or that he'd done like shenanigans.

I remember Olaus from my childhood mostly as three images: first, as the outdoorsman so in tune with the world; second, as the internationally respected mammalogist lecturing in a large Washington, D.C. auditorium; and third, as the Olaus who danced in our living room in Far North Eskimo style; my parents would scorn, were that Elvis or Chubby Checker who danced, but not Olaus. Olaus, as person and as advocate for wildness, calls to mind Salvadoran poet Ernesto Cardenal's assertion that "The economy of the future will be to make things more beautiful."

I re-read Olaus's journal of the 1961 Sheenjek trip last week, and he notes that the mosquitoes arrived at Lobo Lake, in what had been designated as the Arctic National Wildlife Range the previous year, the evening before Steve

Griffith and I flew in. What a revelation for me! (I had read this journal before, but this tidbit didn't sink in.) In 1961 and since that time, I had thought the mosquitoes came with the country in summer. Not necessarily so. Olaus and Mardy had been at Lobo Lake with Sierra Club wilderness stalwart Charlotte Mauk for two weeks before Steve and I flew in with bush pilot Keith Harrington. They had had no mosquitoes until what Olaus described as "a swarm" the night before. "Last night I found a swarm of mosquitoes," Olaus wrote on June 14. "This is the beginning of the mosquito season apparently."

Apparently, Olaus wrote; I can imagine a diary entry like: "This boat we're on, the *Titanic*, is sinking—apparently." I have never, ever experienced such mosquitoes. They were so bad that you felt smug in your tent. Steve and I each had a pup tent. Outside, the mosquitoes wing-whirred and tap-tap-tapped, pinging the tent fabric.

My Sheenjek Valley entry was not grand, as Mardy wrote: "Edward, poor child, had been airsick all the way from Fort Yukon, but . . . [he] made such a quick recovery that he had caught two grayling by five o'clock, and from that date on we never lacked for fish." Pilot Keith didn't carry motion sickness bags. He did have an empty Kleenex box, though. On our flight out he made a point of bringing bags, but I took airsick pills and had horrendous dry heaves instead.

Halfway into our stay at Lobo Lake, Keith Harrington flew in with mail, supplies, and a homemade cake from his wife. The mail included typescript from the publisher of Mardy's manuscript, soon to be her warm and wonderful book *Two in the Far North*.

In my tent one rainy afternoon, I read the "Wild Goose Chase" section. If you've read it, you know I was reading the worst mosquito tales ever, reading them to the mosquitoes' constant wing-whine chorus and tap-tap-tapping my tent like misting rain. Olaus and Mardy took then-baby Martin on that 1926 trip by boat into the wilds. It was a geese-banding wild goose chase fraught with mosquitoes. The boat engine crankshaft broke, too, the *crankshaft*, out back of beyond—the only part they carried no spare for. They took the boat back down to a creek to tie it up securely. Then they pulled and polled the skow. It could have been 250 miles upstream, Mardy writes. No GPS back then. Crank shaft aside, their 1926 Old Crow trip raises the doctrinal question: Does the mosquito have the Buddha-nature?

Mosquitoes do have their niche. I never cleaned a grayling from Lobo Lake that summer whose stomach wasn't distended, stretched full of larvae, which I *assume* were mosquito larvae. What else could be so superabundant in the summer Arctic except rhododendrons, a more pleasant Sheenjek surprise, already in full bloom, and ubiquitous? We had to avoid stepping on them. The summer Sheenjek country sure held surprises. Lobo Lake grayling fed only every third day. In between they only hit spinners they must've seen as invaders of their territorial imperative.

A second confession I must make is that, at first, that Sheenjek country didn't seem all that wild to me. Why? Because you could see forever. I had mostly spent summers in the famously forested Adirondacks, whose trails Evelyn Schaefer Greene calls "green tunnels." As our family's youngest, shortest child, for several Adirondack summers I stared stinging nettles in the face in those green tunnels. To break above tree line is not the Adirondack norm. So, to sit on the hill above our Lobo Lake camp in the Sheenjek Valley and to see for miles in a 180-degree view, well, how wild could it be?

As wild as wild can be, in fact. Beyond words, even.

Unlike the 1956 Murie Expedition to the Sheenjek, we did not get to Last Lake in 1961. Keith Harrington flew Olaus and Charlotte Mauk up there to check it out before he flew Charlotte out that same day. "The valley is very wet," Olaus wrote, again of the June 14 flight with Keith; "Lots of ponds and some overflow ice. On one area of ice we saw a grizzly bear." Indeed, as wild as wild can be.

Even bush pilot Keith Harrington embodied a mid-1900s conservation story. Keith had been a bush pilot in Minnesota's Boundary Waters canoe country, but Sig Olson, Ernest Oberholtzer, Olaus, Fred Packard, my father, and many other conservationists had campaigned—and eventually succeeded—to halt airplane landings in the Boundary Waters. So Keith Harrington had come up to Alaska to keep flying.

And Keith sure held no grudge, or he would have eaten that cake his wife made for Olaus and Mardy and their ravenous 15-year-old charges! As Celia Hunter said of Mardy and Olaus in 2000, "They were tremendously human in their contacts with even the people who disagreed with them. They had a way of disarming them very nicely and convincing them, much against their will sometimes, that there was another point of view." Rest in peace, Celia. We miss you and your constant wild witness.

The cultural ecologist E.N. Anderson holds that conservation is not about natural resources; it's about the social contract. "Conservation," he writes in "Ecologies of the Heart: Emotion, Belief, and the Environment," "is simply a form of mutual, caring respect." Olaus and Mardy embodied and lived that credo. How could such gentle people be such fierce advocates? They showed that you need not be angry to advocate wildness. It's about mutual, caring respect, and extending that mutuality of caring respect to the more-than-human world, to the Arctic Refuge, to the Arctic Coastal Plain.

That's what Aldo Leopold urged us to do: to extend the bounds of the ethical community. The 1964 Wilderness Act is a socio-political step toward that, and maybe an inchworm-sized move toward the legal standing for the more-than-human world that Justice William O. Douglas and attorney Christopher Stone called for in 1979 in the dissent to the Supreme Court ruling in the Mineral King case in California's Sierra Nevada.

Here's a poem, ground-truthed with my journal, that recalled our 1961 Sheenjek trip 20 years later:

Sheenjek River

Wolf tracks on a silted gravel bar:
I found them just off camp in a drizzle.

Got the others and off we went to cast one.
Mosquitoes kept down by light rain.

Mixing silt and plaster, Olaus messes his hands.
The sky clears and mosquitoes come out.

Brushing them off his head gently, gently—so as
not to harm them—blood mixes with this mud.

The perfect wolf track cast in silty definition:
Tonight the river rises, and for the second time

this wolf just disappears.

A fresh wolf track in glacial-flour silt on a Sheenjek River bar looks like sleek, fired ceramic artwork. "Beauty waits in ambush for us," Jorge Luis Borges advises; "Beauty waits in ambush for us."

But you must ask yourself: does a mosquito, full of *your* blood, qualify as an "other blood?" Who knows? But Olaus exuded the reverent *ahimsa*—do no harm—of the Jainist toward the more-than-human world, despite, as a scientist of his day and time, needing to take specimens. In some of Olaus's paintings and drawings of animals—these other bloods, as the naturalist Bil Gilbert says we should honor fellow critters—Olaus's "other bloods" seem to possess individualities, unlike in most field guides.

My father's copy of Olaus's "A Field Guide to Animal Tracks," in the Peterson series, seems lived-in by its subjects—who feel like subjects, not like objects. We forget to what extent Olaus and Adolph were the pioneering "bedroll biologists" after a period of mammalogy that devoted its time largely to laboratory counts of bumps on skulls. Olaus and Adolph came at it more like the poet Mary Oliver, who wrote, "My work is loving the world."

Here is Mardy writing about Olaus on their 1926 Old Crow River wild goose chase: "Olaus has a biologist's scorn of allowing anything biological to disturb him. All creatures are a legitimate part of the great pattern he believes in and lives by. He ignored the mosquitoes with a saintly manner that made me furious at times!"

Mardy's fury would abate. She ends that section of "Two in the Far North" with: "Here, on the Porcupine [river], with the wolves of Hanging Woman Creek, we would be leaving perfect at-oneness with the untouched."

A Fairbanks friend of Olaus questioned the young Mardy in the early 1920s: "What are you marrying that fellow for? He's half caribou…" Eskimo companions named Olaus "little bird white man." Olaus would later become "Mr. Elk" to many, and Olaus once called down an owl right into their camp, to Mardy's everlasting amazement.

Of a 1922 trip into the Brooks Range, Olaus mused: "I seemed to want to roam over these plains myself, like the caribou, and feed on lichens, face the winds, and travel on and on." In the movie of her life, "Arctic Dance," Mardy nails it, saying of Olaus: "He had a kinship with untamed land wherever he found it." In that, Olaus personified Leopold's land ethic and his call to extend the boundaries of the community. Kinship with untouched land.

Olaus could not have done the half of it without Mardy, who survived him by 40 years to receive a fistful of conservation awards in her own right, including the Freedom Medal bestowed by President Bill Clinton.

Christine and I took my mother Alice Zahniser to the Wilderness Society reception honoring Mardy's Freedom Medal in 1998. Mardy came in by wheelchair, with a woman wheeling her. My mother, who was then 80 years old and well aware of aging, told Chris and me later that when she saw Mardy in the wheelchair her first thought was, "I wonder who takes care of her?"

Later, some of us gave our regards to Mardy, very briefly, one-on-one. When it was my mother's turn, Mardy said to her, right off the bat, gesturing toward the woman standing behind her wheelchair, "She takes care of me."

After the Sheenjek trip in 1961, Mardy and Olaus, Steve Griffith, and I went down to Mount McKinley National Park—now Denali National Park—for a couple of weeks with Adolph and Louise Murie. Steve and I, chaperoned by the intrepid retired logger character Joe Hankins, collected grizzly scat for Adolph's bear book, climbed Igloo and Cathedral mountains, and crossed those mountains to photograph Dall sheep. Out with Adolph by government Jeep on the park road one day, we saw 26 grizzlies. Can you imagine such a summer? In some ways it seems a dream, but for all of our journals that witness to it still.

This happened on the Fourth of July, 1961, on a fork of the Toklat River in Mt. McKinley National Park.

Wolf

Fourth of July, hunkered
down in a small depression
on the wide floodplain

photographing chicks
of a Baird's sandpiper
when a coal black wolf

happens onto us
upwind to 42 paces
measured later but

not until our hearts
and minds have leaped to deep
pre-Revolutionary pasts

no fireworks display
will henceforth ever
hold a Roman candle to.

The four Muries, Olaus and Mardy and Adolph and Louise—half-brothers married to half-sisters—have had an enormous and continuing impact on my life and work. Only Louise now survives. Mardy died in 2003 at age 101. Memorializing Mardy's conservation vision, Verlyn Klinkenborg wrote that "Over the centuries, the ink has gone to the discoverers, the [people] who found or claimed or opened new territories. But we've gotten to a place in history where the preservers are the ones who deserve the ink."

"…the preservers are the ones who deserve the ink." Go forth. Do good. Tell the stories. Keep it wild. Deserve the ink.

Short Film: Ebb and Flow— Filmmaker: Dawn Fidrick

Hi everyone, I'm a little nervous and humbled to be here and to have you see something I made as my graduate thesis animation at School of Visual Arts in New York City. I've been here all week, hearing all of you share your real experiences in landscape, the real work that you do to protect this place that inspired me to create this animation.

When I went to graduate school, I didn't intend on creating this piece, but when I discovered that places like the Arctic National Wildlife Refuge existed, I was drawn to it. I have sort of redefined my goal as an artist to dedicate the skills that I've learned and been fortunate enough to this cause, and to be in the company of people such as yourselves. So, it's a real pleasure to be here.

I just wanted to share with you something that came to me this week based on a lot of the things that you all have been talking about; it's a quote that I remembered from long ago that really inspired me to pursue art as a career. And that is a quote from Albert Einstein. It reads, "The most beautiful thing we can experience is the mysterious. It is the source of all true art and all science. He to whom this emotion is a stranger, who can no longer pause to wonder and stand rapt in awe, is as good as dead: his eyes are closed."

And it's that mystery, the mystery of the wild that I've heard all of you reiterate, that reminded me of how important this quote was in pursuing a life of art, and trying to find the emerging place between art and science.

I hope to continue to use narrative, fiction, and animation as a way to bring young audiences and audiences who may not already be on the same page as ourselves over to the side to see the beauty that you've been able to preserve for us.

Thank you. If you'd like to talk about more, I'm most certainly pleased to have your attention. Thank you.

Brad Meiklejohn: "Across the Refuge in 20 Years"

Steve and I go way back; we go all the way back to nursery school, in fact. Steve and I were in the Arctic Refuge together when these pictures were taken, the lower one at Last Lake looking north, the upper one at Double Mountain looking across the Sheenjek. I know it was a very special experience for Steve, and it was a special experience for me to get to share the refuge with Steve. I've had the great fortune of going to the refuge every year since 1989 on a long trip; the shortest ones have been two weeks, the longest trips have been three months. And in part, I should thank my employers as well.

A little shout out to a fellow named Bob Putz, who was mentioned by Jimmy Carter. Bob had a big hand in creating NCTC, and was the guy who put some faith in me and hired me to work for the Conservation Fund in Alaska. The Conservation Fund has been a great employer for me and has allowed me to indulge my passion for the Arctic Refuge.

So, today I want to share some of my experiences, some of my thoughts, some of my discoveries, and I promise you there'll be a couple of bombshells along the way, literally.

USFWS/Steve Chase

Arctic National Wildlife Refuge

The blue lines on this map trace the routes that I followed across the refuge over the 20 years that I've traveled there: some the river corridors, some cross-country walks stretching for hundreds of miles. It's one of the few places on the planet that I've found where you can do that, where you can go for weeks at a time without crossing a road. And it's worth keeping in mind that in the "lower 48" you can't get more than 21 miles from a road. So, the Arctic Refuge, in my mind—it may be disputed by some—is the last great wilderness. I've had the fortune of traveling all over the world, to Asia, to Africa, to South America, working and living in South America, and there aren't many places like this; there may be a very short list of them, but this is the only one that I've found yet.

Some of the trips have been solo trips; I go without a gun, without a radio, without a sat phone. Sometimes it's hard carrying three or four weeks of food, but the first weeks are the hardest weeks, as they say. I've taken my best friends along, the four-legged kind and the two-legged kind. And, if Roger's here: Roger, I did make my dog Roxie put that caribou antler back for the mice. The four-legged and the two-legged have accompanied me on small trips, big groups, big boats, and small boats. And if Kim Elton is here, this is his body double Pat Pourchot, a good friend of mine working for the Department of Interior in Alaska. And this is one of these little special boats that have really changed the way I travel around wild Alaska called the Alpaca, pack rafts. So, we've had big boats and small boats, and the small boats with dogs. Sometimes a big load for the boats, but everybody's happy, it takes the load off the legs, and it really is a nice way to travel. And it's a great way to catch up on your backlog of *New Yorkers* that tends to build up. They're amazing little craft; Forrest is a convert addict, I might say: you can look him up on YouTube, he's got some great pack rafting videos, he's one of the early pioneers of pack rafting. These boats are miracle boats, they transform wilderness travel: they're four pounds, yet they can carry over 200 pounds. And they really open up the country, they expand your range; no longer is a river barrier, but it's an opportunity.

I rarely go back to any place twice, and I've been all over the world, seen a lot of amazing places. But I've gone back to the Arctic Refuge every year since 1989 for a long immersion. The reason I go… there're lots of reasons I go, and yesterday's snafu with the technology may be one of the best examples of why I go. This will be my only quote of the day: Woody Allen once famously said that, "Nature and I are two." And I think that defines my relationship with technology. I go to get as far away from the madness of the modern world as I can. I go to escape the e-mail swarm that engulfs us hourly and seems to accelerate, the trivia of Twitter and Facebook and the 24-hour news stream. I go to visit the real Alaska, not Sarah Palin's Alaska. I go to the Refuge because it's one of the few places on the planet where you can walk, as I said, for hundreds of miles and dozens of days without crossing a road, without seeing a building, without hearing a motor, if you're lucky. I go to be reassured that the world can get along just fine without us, that we're not as important as we tend to think we are. I go to find out what it really means to be alive; it's the place that makes me feel alive. Like Sarah James said, "It's about surviving." It's a place that requires me to live by my wits, and that's a rare challenge these days. It doesn't take much to live in today's world. To go out and live by your wits, by the senses that have developed in us over millennia, over thousands of years. This land shaped us, it shaped the senses that we have, our senses of smell and hearing, touch, sight. We're creatures of evolution; these ancient lands shaped us to be what we are now, and these senses that we have, if we don't use them, they dwindle. When I go out, it takes me several days to begin to see again, to begin to hear again, to become aware of everything that's going on around me, because those senses atrophy in our modern world.

I reject the connotation that I'm any kind of great adventurer. I'm just going out and doing what feels good to do, and we're all capable of doing this; I'm not superhuman, we're all capable of doing this. It doesn't take a lot of money; this is not an elitist opportunity. You can walk into the refuge from a road. I've done trips as cheaply as a $100.00 for three weeks, eating a lot of beans and rice. But those who would tell you that this place is preserved for only the wealthy elite need to be corrected.

It hasn't always been fun: the weather sometimes sucks, the bugs often are terrible, the walking can be miserable in the tussocks, but it's all worth it. Even spending five days subsisting on Eskimo potato root at the end of a 17-day trip when things didn't quite work out, we had five days of eating roots, but at least we had a Frisbee.

In the meantime, in all of these wanderings and travels I've had intimate experiences with all the critters of the place. I've been blessed. These memories are engraved in my mind, and I can't go a year without a fix, a big hit of the Arctic Refuge, because it's where I live, it's where I come alive, it's where I feel most at home, living by my own wits. And being a bird, there's no greater place on earth, whether it's Smith's Longspur, Snowy Owls, thousands and thousands of shorebirds, or the snow geese, or the fish as beautiful as the place itself, and certainly as tasty.

Along the way I have found signs. Roger says that there are no signs; there are signs, places not pristine. Some are quaint, such as this ancient dog sled and ancient sled dog; some are tragic, including many wrecked airplanes I've found scattered around the refuge with stories of their own, some of them I know, some I don't know.

Increasingly, the hand of man is apparent on the Arctic Refuge. We've heard the scientists tell us about melting glaciers and collapsing permafrost; this place is ground zero for global warming: I guess we don't use the word crosshairs, but it's in the surveyor marks of global warming. The ground is literally caving in as

the ice melts, and places smell like a barnyard from the emanation of gases—not methane, because methane is odorless, but gases trapped in the tundra that are more potent greenhouse gases than carbon dioxide. This place is crumbling before my eyes; in the 20 years that I've been there, it's accelerating, and we've heard that.

And those who would deny this would change the argument, no doubt, and say, "Well, you want it to be colder, I like it warmer." We may not be able to convince them with the facts. I don't know what it will take; we certainly need more spokesmen, spokeswomen, spokes-folks, lots of voices all singing together about this place, this wild planet.

These collapsing hillsides, this is one expanse of permafrost about a half mile in width that collapsed down into the river, turning this blue river to brown just downstream; this ice cliff, 50 feet tall and a half-mile long, with exposed permafrost. It's not just a Fig Newton of our imaginations; it's happening. As we've heard from Matt, George, and Forrest, the brush is increasing, which makes the travel more difficult. Thunder and lightning on the North Slope, relatively unheard of 20 years ago, are more common. Vast, open expanses of the Arctic Ocean are eroding the arctic coastline, exposing ancient settlements from thousands of years ago; they're washing into the ocean. As the ocean invades, we're losing 50 meters of coastline a year—50 meters a year!

Wendy Loya, who's here in the audience, traveled with me this year from the haul road to Arctic Village, passed through the upper Ribdon Valley; most of these alpine glaciers mapped in the '50s and '60s no longer exist, as we've heard from Matt.

The hand of man is on the Arctic Refuge in many ways; lots of unfortunately human settlements are within the Arctic Refuge, scattered throughout the wilderness areas, that become trash heaps that expand and change the experience.

One of the unfortunate compromises of ANILCA, in my mind, allowed for aircraft in wilderness areas. To my mind, that's one of the great ironies: our greatest wilderness allows airplanes. There's room for improvement in these things, in the Alaska Lands Act. I just violated Tom's rule about acronyms. It's amazing how an aircraft can change your experience; I have had trips where I've gone for several weeks without hearing aircraft in the refuge, and it's quiet a pleasure to be immersed in natural silence. There aren't many places on the planet where we have that opportunity anymore, and we learn about ourselves, we learn about our senses, we learn how we evolved, what we're here for.

Still scattered across the refuge in many places are 55-gallon drums, relics of early oil exploration, military activity; these need to be removed. A boat wreck in Demarcation Bay and wilderness, a Cat Train on the south side of the Brooks Range, a Seismic Cat Train, a nuclear powered radio antenna array in the foothills of the Brooks Range on the south side of the Arctic Refuge; these things need to be removed.

Most shockingly, this past summer Wendy Loya and I came across the most startling thing that I've found in 20 years of traveling through the Arctic Refuge; it is what it is, it is what it looks like, it's a rocket. And my dogs thought it was great habitat for ground squirrels. This is the second one we found on the same day, by a wild river called the Wind River flowing off the south side of the Brooks Range. I couldn't have been more astounded to find two of these in the same day. So, I'm please to announce that, in cooperation with President Carter's Habitat for Humanity, the Conservation Fund has begun work on constructing bomb shelters for the caribou to protect them from this bombing campaign!

And, if you take nothing away from this talk, I hope you will correct everyone at every opportunity who uses the acronym that to my mind sounds like the name of a dead Egyptian president: it's not ANWR, as Mardy would remind us; it's the Arctic Refuge. At every turn, language has power.

Unfortunately, this program of bombing the Arctic Refuge has been going on since 1969, some of the dirty secrets that no one knew about. Even Allen Smith, who's been working on Arctic Refuge issues for 30 years, didn't know about this; none of us knew about this, but somebody knew about this. These are not darts; these are enormous rockets, 70 feet long, 12,000 pounds, launched from Poker Flats Research Station in Fairbanks, many of them landing on the Arctic Refuge. This map shows the rockets that have landed on the Arctic Refuge since 1997, the red dots. The ones that haven't landed on the Arctic Refuge have landed on the Yukon Flats Refuge.

The level of precision in predicting the locations of these rockets is admittedly, NASA admits that these rockets may be 40 or 50 miles from where these dots are. Some of them are likely in wilderness, a clear violation of law. This program is being permitted by the U.S. Fish and Wildlife Service. The purpose of the program, ostensibly, is to study the aurora; I would contend that the best place to study the aurora is the Arctic Refuge itself, and that we don't need to bomb the Arctic Refuge to study the aurora. NASA admits that the reason they bomb the Arctic Refuge is it's the most expedient, the most cost-efficient place to do this research on the aurora. I would contend that we should not sacrifice America's crown jewel for the sake of cost efficiency and expediency.

Some would dismiss this as relatively trivial, and I would admit the impact is not so great—there's some metal shrapnel around, probably very few caribou have ever been hit—but to me, it's a parable for how we think about the refuge, what it means to us, how we treat it, and I think it deserves much, much better. This is our greatest conservation achievement, and we can do better.

We've actually been able to encourage NASA to pursue an environmental impact statement; they were trying to get away with an environmental assessment. This is an open process, folks, this is something that you can participate in, this is something that you can weigh in on. Amazingly, the Service has chosen to not include the rocket issue in the preparation of their comprehensive conservation for the Arctic Refuge. For some reason, the rockets are a side issue that really merits no further investigation; I would differ. I hope you'll get involved in, provide your comments. It's timely; this issue is happening now.

Again, I say, the Arctic Refuge deserves better; it deserves the best of us—that's the best of me, I guess. We've heard from Amy Vedder and others that the Arctic Refuge has served as a conservation model emulated around the world, and I think that we need to make sure that we're exporting the best possible example and treating this place with the management that it deserves. And I know that there are always political considerations, budget considerations, bureaucratic considerations that guide our management decisions, but I would contest that there is never a wrong time to do the right thing.

What I've witnessed in my 20 years of traveling through the Arctic Refuge is a steady chipping away at this crown jewel; the Arctic Refuge is showing signs of wear and tear on our watch.

Those who know me know I don't go in big for fondling dusty backpacks and faded field notes, and I think that the Muries… We've spent a lot of time reflecting on the accomplishments of our conservation forebears here at this conference, and that's all well and good; we stand on the shoulders of giants. But I think they would ask of us to develop our own big ideas and to work on our own big achievements. Tom had an interesting idea that we should all issue the land managers these bracelets that remind them, "What would Aldo do?" I'd twist that and say that those bracelets ought to read, "What will I do, what will my contribution be, how will I pass this wild planet on?"

Jeff Jones: "The Creation of the 'Arctic Sanctuary' Art Show"

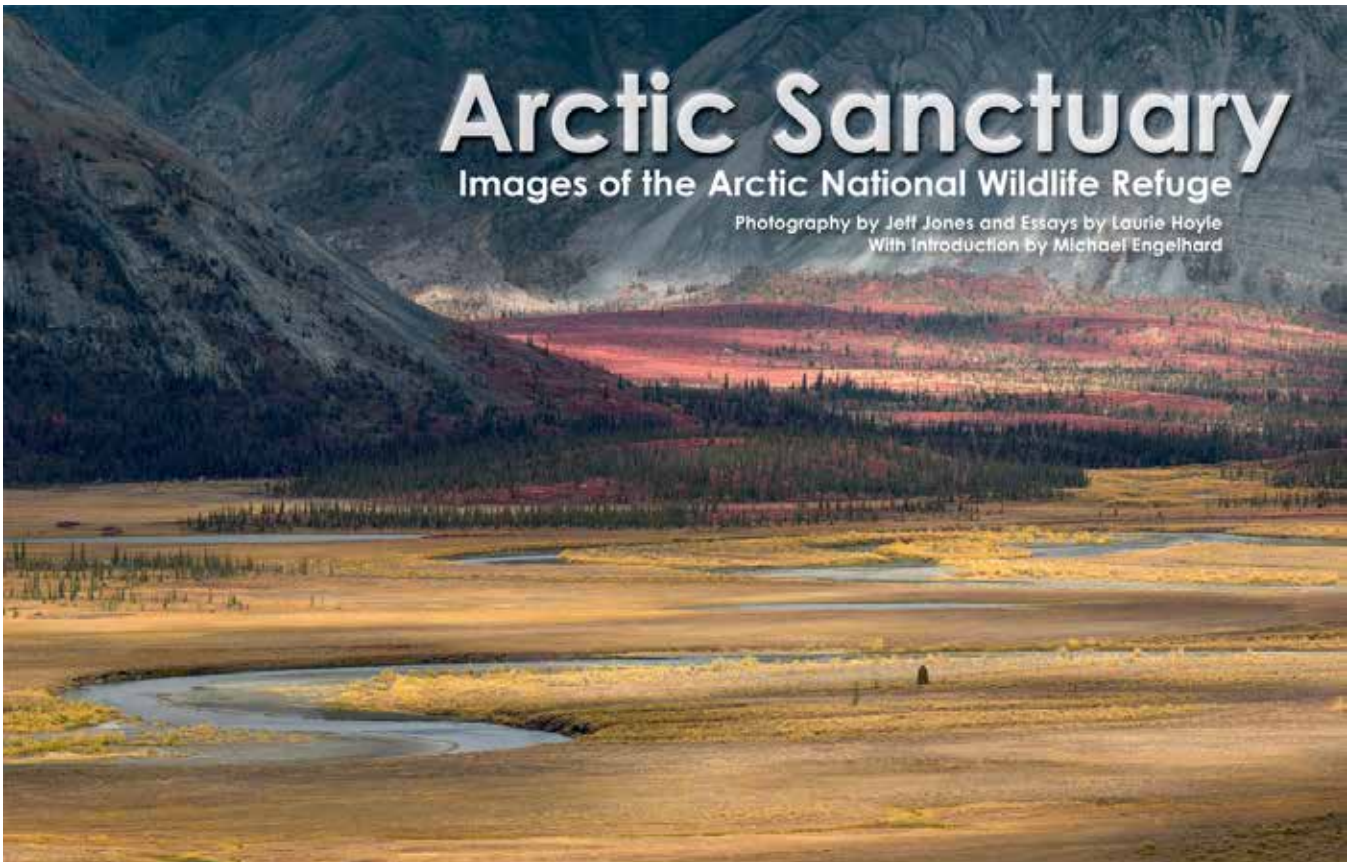
I'd like to begin by saying a few things about my photographic interest in the Arctic Refuge and about my approach to photography.

What I love about photographing in the Refuge are the big, long views, great vistas, the sweeping, curving lines of the earth carved by glaciers, photographing in summer at any hour of the day, the light, and many hours of low-angled sunsets and sunrises. These aspects, combined with an utter sense of wildness and being the largest conservation area in the U.S., make the Arctic Refuge the highest quality photographic experience for me.

I like to get to know an area, so I return to it again and again. In doing so, I begin to understand the subtleties of a place and am treated to some of its secrets. Patience, perseverance, scouting, and time spent on the ground all pay off in being ready to snap that shutter when the light is right.

I'll use this image as an example. The couple of days leading up to this photograph had been gray and at times drizzly. Before breakfast on this morning, the drizzle stopped. So, I sat at the opening of the cook tent to keep an eye on the clouds coming in over the west side of the valley. As I ate, I saw a very small patch of pale blue emerge in the western sky. I watched as it grew in size. It was the first sign the gray might be over. I ran to collect my camera gear and hustled up the east side of the valley to a place I had already scouted out. The western sky drifting in over the valley was opening up. I set up my tripod and was rewarded with this scene.

I produce large prints so that the viewer can get lost in the details and step into the scene. Even though I use a 35mm camera, I can create large panoramic prints by shooting a series of frames across the scene. Later, on the computer, I combine that series of frames into one large image. I'll talk more about this later.



Jeff Jones

Now on to *Arctic Sanctuary*, Laurie Hoyle's and my exhibit and book. The refuge is many things to many people. The focus of our work has to do with its intangible values—its beauty and inspiration, its benefit to a greater sense of humanity. At different times and to varying degrees, people sense that we are part of something much larger than ourselves. One of the great values of wilderness is that this sense is felt most powerfully when visiting a wild place or even viewing pictures of a wild land.

The Arctic Refuge is called the crown jewel of America's wilderness. Yet, what most people currently know about this jewel is that the Porcupine caribou herd migrates each year to the coastal plain to give birth. However, that coastal plain is only roughly 10% of the entire Refuge, and that coastal plain is only one of five of the Refuge's eco-zones. So, most people are unaware of 90% of our crown jewel of wildness.

Most people will never visit the refuge. But, they will value what's there if they know it exists. The purpose of our book and exhibit is to show the public the great breadth and diversity of lands in America's premiere wilderness that are so beautiful and inspiring.

While the refuge is important for many reasons, the one that stands out for me is its wildness. Let me give you some facts that indicate this wildness. Some of these have been mentioned already, but are worth repeating: there is no imprint of our modern civilization in that there are no roads, buildings, trails or signs. All species that were there 100 years ago are still present, and there are no known introduced species. There are only 1,000-1,250 visitors to the Refuge per year.

At 19.3 million acres, we've heard several times already how the state of South Carolina measures up, but here is a comparison of the state of West Virginia with the refuge: West Virginia is 15.5 million acres. Imagine a land larger than this state that's roadless, trailess, without signs and buildings, and has only about 1,100 tourists a year. The refuge is larger than any of our national parks, our national forests, and is the largest of all of the National Wildlife Refuges; in fact, the Arctic Refuge is the largest conservation area in the United States.

It's remote, tucked up in the northeast corner of Alaska. Its eastern boundary is the Canadian border and its northern boundary is the Arctic Ocean. The way to begin a trip in the Refuge is to fly in by bush plane.

It's diverse, containing all five arctic eco-zones, which are the ones shown here on the map: arctic coastline, lowland tundra, mountains, taiga, and boreal forest. So, at the northern edge of the Refuge is the treeless arctic coastline, followed to the south by lowland tundra, where the Porcupine herd calves, then up over Mountains to the transitional zone of taiga, into thickly treed boreal forest.

So, these are some of the facts about the Refuge's wildness.

Let's now take a closer look by journeying back northwards through the five eco-zones beginning with the boreal forest.

On this journey, I'll show representative images of each eco-zone, talk a little of my interest in some scenes and say more about how I work, and give a little information about what's going on in some scenes.

Here's a rain shower in June. Notice the densely forested land; the topography is generally flat or low, rolling hills populated by ponds, lakes, and rivers. To reach places to photograph, I raft, back pack, snow mobile in winter, as well as day hike from base camps.

Sometimes, rivers are lined with interesting bluffs. What interested me in this scene is the repetition of triangles: the trees, the sunlit rock face, and this foreground group of trees; also, the striking contrast in shadow and sunlit rock faces.

A field of Dryas flowers that have gone to seed on a dry bench above a river, about 9:30 at night.

Here is a close up of those seed heads the next morning in the low angled sunlight.

The cloud streaks on the right are called virga. Virga is the condition when precipitation doesn't reach the ground because of higher temperature and or humidity near the ground.

11:30 p.m. in July 2009: the red in the sky is from the smoke of fires far away. During the summer of '09, over 3 million acres burned in remote areas of Alaska. Because of their remoteness, they are not covered in national news, unlike the comparatively small fires in my area of Santa Barbara, California. The fires burn until put out by rain or snow, but more than what's falling on the water, here.

Sometimes, I'm interested in a scene because of the story within it, but, while the story may be of interest, for me, the image also needs to be artistic. For example, this image tells the story of the curve's progression in this river bend. Again, I imagine most of you already know the details. I wanted to get a photo of this story, but chose this one in part for the topographic relief in the trees, the strong perspective in the curve, and the tall bluffs.

Knowing in advance something of the kinds of scenes or stories you want to capture is very helpful because you'll be ready to look for it. And as in the case here, flying at 90 mph requires quick decisions of whether to shoot or not. It also helps to shoot a lot of frames to choose from later.

Here's an example of an image from the taiga eco-zone that tells the story well, but is not strong artistically. Except for the shadow at the top, the lighting and relief are pretty uniform. A lower angle of light or more broken sunlight might help.

Here is a majestic bluff along a river. The light and dark coloration of the rock is accentuated by the sweeping lines and low-angled light.

Here's a scene reminiscent of the Pacific Northwest. The water was chilly, but the air temp was about 85 F on this July day.

More tall bluffs at about 1:15 am.

For the next few slides, I'll talk a bit about my technique. Each night I copy the photos I shot that day from the camera's memory cards to a hard disk. The computer clock here says 2:29 am. The lure of photographing at any hour makes sleeping a challenge. The laptop, hard disks, card reader, and cameras require electricity. On long trips, the batteries run down, so I need to recharge them. One of the challenges of working with electronic equipment in the Refuge is being off the grid. I recharge them with a solar panel, which is a great choice in the Arctic's round-the-clock daylight.

The next photo is a look underneath the rain fly. Here, an orange-and-white battery sits atop the laptop case while being charged by the solar panel. It takes about 11 hours to recharge this battery when it is completely run down. This battery is then used to provide the 110-volt power needed to recharge the electronic equipment.

Here the orange-and-white battery is charging the laptop. This is usually necessary every three days and takes about two and a half hours. I'll let this run while I sleep.

While I'm glad to be able to use my digital cameras, the downside is that I end up spending a great deal of time attending to all of this technology. There's little time to appreciate and enjoy the wilderness. I love photographing in the refuge, so I accept the time requirements. However, if one plans to visit the refuge to take in its wildness, then I recommend leaving behind as much technology as possible. It only diminishes the wilderness experience.

OK, now we move northward into the taiga eco-zone. Taiga is the large transition zone between the relatively flat boreal forest to the south and the rugged mountains to the north. It is a transition in both topography and vegetation. There's a wide mixture of terrain and vegetation. In general, the density of trees lessens, in some areas to zero, as in this image.

Here there are thick stands of trees in the distance, and less dense stands in the foreground. Photographically, this is a traditional view with a foreground, mountains and sky. This kind of view most everyone understands because of the familiar relationship of objects. The view says this is a vast and beautiful land. The river and mountains fading away into the distance beckons one to come explore.

There's no sky in this scene; it would have been a distraction, here. Instead, I want the viewer to feel the intimacy of what is close at hand. The proximity, clarity and serene feeling of the near objects invite you to step right in. Again, the stream tapering back into the distance beckons to you to come explore. Most people that see this and other similar images are surprised to learn this is refuge. They don't expect lush, green, forested areas, and they don't expect the temperature to be 85 degrees as it was this July day.

In a flatter region of the taiga, clouds are reflected in ponds. The bottom of the large pond is visible in the lower left corner.

A creek meanders through the taiga.

What works about this image is how the sunlit knoll with its couple of trees stands out against the shadowed background. The exit point in the top right provides additional interest. This is an example of the patchiness of trees found in taiga.

This image is alive with swirls of shapes and color, and the ground shadows accent these features. I like how the far right sunlit area mirrors the content of the near part of the image. At lower latitudes, the leaves of deciduous trees are the source of fall color. Here, deciduous trees are very sparse, and it is the leaves of bushes that create the carpet of fall colors.

I'm drawn to abstract scenes in nature. Here, the gentle terrain is accentuated with streaks of fall's golden willow. Sun and shadow are near perpendicular to the diagonal of the willow. Diagonals are common compositional elements for me. Keep an eye out for them.

Sparse trees, brilliant colored ponds, and fall bushes.

This image suggests that winter is not very far away.

We now leave the taiga and move northward into the mountain eco-zone. Mountain is the largest eco-zone in the refuge.

The limestone scalloping and streaks of talus give this scene a very primeval look. As elevation increases on the south side of the mountains, the trees thin out until they are no more.

This was photographed the morning of the summer solstice. During the previous night, snow fell at the higher elevations while rain fell in the valley.

Here at higher elevations, the trees are gone. The lake represents some of the headwaters of river system that flows south 200 miles to Yukon River then west on to the Bering Sea. Landscape photography is often about fleeting moments. The spots of sunlight were moving fairly quickly.

Up and over the divide: by placing a lower elevation peak in the foreground, much of the frame could then be filled with taller peaks and provide a sense of depth and mystery.

Except for a very few isolated stands of balsam poplar, there are no trees in the Refuge north of the continental divide all the way to the Arctic Ocean.

This is at about 8:30pm in late June. Mosquitoes can be a real challenge. On this trip, my travel companion was Fran Mauer. The first night I tried to photograph this scene, the bugs were thick. So, Fran stood off to the side of my tripod-mounted camera and furiously fanned a booklet in the hopes of removing the mosquitoes, but to no avail. I wasn't going to get the scene I wanted this evening. We tried again two evenings later. There was now a gentle crosswind that kept the mosquitoes at bay, and I was able to capture this scene.

Lovely color and folds in the sunlit mountainside.

Most peaks and valleys in the refuge are nameless. I understand how some people wish to have a name for each feature so that everyone can communicate their experiences about a particular place; however, this approach overlays someone else's ideas and experiences upon the landscape. Not naming peaks, valleys, and rivers better enables one to have their own personal experience with the land. For this reason, I didn't name the specific locations of images in our book.

This lovely abstract scene shows a land that is active. Here's why: this river flows through a steep-walled valley. On each side of the main valley are side valleys, out of view. The sediment or alluvium that washes out of these side valleys spreads or fans out upon reaching the main drainage. So, what we're looking at here are two alluvial fans, one on each side of the river.

Here's another bit about my technique: using a standard proportion camera, I photograph a panoramic scene with a series of sequential frames that covers the scene. Later, with the use of a computer, I combine the sequential frames to recreate the scene through a process called stitching. I use a specialized tripod head for panoramic photography that I've developed over a number of years with the help of a machinist. The horizontal rails on the side of this tripod head allow for adjusting all of my cameras and lenses to their right nodal points. The base of this head incrementally rotates the camera through a scene for equally spaced sequential frames. The big fin on the side of the head enables me to shoot multiple rows.

Why go through this? Why not simply shoot a single frame with a wide-angle lens? With a wide-angle lens, far objects are disproportionately smaller than normal, and I don't want distant objects to become small. I like detail, which only comes from lots of pixels, and all those sequential frames provide lots of pixels. Sequential frame photography does not limit the proportions of my scenes, as any single-shot camera would do.

Here are four examples of stitched mountain scenes. Content-wise, these four have in common the sweeping lines that draw me so much to the Refuge. This is a single row of sequential frames.

15 minutes before midnight near the summer solstice, what really caught my eye was the golden, backlit ripples in the water in the lower right. This is a single row of stitched images.

This is 4:00 am in a north side valley in early August. The river is over a mile and a half away. 24-hour light allows for photography any hour of day. This is a single row of 10 frames, I think. I shot this with medium-format film that I later scanned.

This is two rows of frames, eight frames per row. I used a 300 mm lens for this scene. Using a longer-than-normal lens reverses the effect of a wide-angle lens: far objects appear larger than normal. The effect pulls the far closer. When considering how to photograph this, I knew I liked the shape of the far wall, and wanted it to become a prominent part of this valley scene, so I used a longer-than-normal lens to pull it in.

The next four images are geologic features in the mountains; three are aerials and one is a close-up image. I'll quickly run through these four, and see if you can pick out the close-up. I'll then go back through them and ask you to identify the close-up.

Sense of size is difficult; sheep trail.

Eroded limestone.

This is a close-up of a rock about two feet away. Quartzite is embedded in a matrix of limestone. The limestone has eroded away faster than the quartzite, leaving behind fins of quartzite. The orange, black, and white spots are species of lichens.

What caught my eye was all of the color in the rock, the uplifted layers, and the dappled sunlight, Animals are very much a part of the landscape.

Wildlife photography obviously focuses on the animal. Being instead interested in the landscape, I photograph the signs of animal presence. Here is the first of three images showing animal presence. This scene shows trails created by many migrating caribou over many years, particularly on the near ridge.

Here, the lower half of the scene is populated by willow. Notice that most of these willows are a uniform height. This uniformity is the result of feeding by moose, which use this valley as their winter foraging grounds.

What attracted me to this field was the abundance of Dryas flowers. However, I chose to highlight this mound of varied plant growth. This mound has several ground squirrel tunnel entrances. Squirrels sit on the mound just outside the entrances. Their excrement enriches the soil for plant growth.

In these three images, it is the vegetation that clues us in to the presence of animals, and those plant clues are the result of different effects the animals have on the land and plant communities.

Those effects are migration, feeding, and soil enrichment.

Near the summer solstice, a pool sits atop aufeis in the river bed.

A lot of my typical viewers don't understand many things about the Arctic, like "how is this ice present in the summer?" So, my art becomes a "teaching moment". That is, I explain aufeis formation to viewers. I imagine most of you know, but if you don't, ask me, or anyone with a FWS emblem on their shirt at the reception.

Both the north and south edges of the mountain zone taper off into gentler terrain. The next seven images are of the foothills of the northern edge of the mountain eco-zone. Here, even at lower elevations the treeless landscape has mostly low-profile vegetation.

In this scene, a mound of red shale breaks the surface of the land.

This is a close-up of another red mound. The scale is difficult to determine. Is this two feet or 200 feet wide? Such difficulty in an image adds interest for me because I spend more time with it trying to figure out what I'm looking at. This rock is seemingly smooth and impervious. Yet, a lone caribou track across the upper right corner suggests otherwise, and clues us in to the scale of this scene.

This is 9:30 p.m. in early August. In the Arctic, the low-angled light before sunset goes on for hours because of the shallow-angled trajectory of the setting sun.

The sedimentary layers of this mesa speak of an aquatic origin.

Another mesa.

Spare but beautiful, the light shining on the converging silver streams is the focal point of this image. The light-enhanced convex surface between the streams keeps your eye in the middle of this scene.

Again, long, sweeping lines from glaciation. The distant saddle is about one and a half miles away.

Now we'll move out onto the lowland tundra or coastal plain, the calving grounds of the Porcupine caribou herd.

This scene, taken from the plain, looks south back to the foothills and distant mountains. I hiked for several hours to get to this spot that had looked good on the map, and was rewarded with this stunning view during a break in rain at 10:15 p.m. in mid-August. It was absolutely still. There was no air movement. It was utter quiet, so quiet that I thought I could have heard a pin drop five miles away. This is a kind of silence that our society doesn't experience anymore because of constant cultural noise.

Again, we're looking southward from the tundra back to foothills and mountains, but in mid-April.

Twice, I've traveled the coastal plain in late winter. I'm unfamiliar with the winter conditions here, so I traveled with Robert Thompson, an Alaskan native, by snow machine. Robert lives in the town of Kaktovik and is very familiar with the refuge's coastal plain.

The shapes in the snow and lines at the cloud front all draw your eye out into the distance. The blue of the ice is replicated in the color of the clouds. This is a view to the east. The wind off the Arctic Ocean blows freely east and west across the landscape. In winter, the wind has a great deal to do with snow formations. The wind forms ridges and grooves of hard-packed snow called sastrugi, a russian word. These are sastrugi on top of aufeis

Here, a coastal plain riverbed fills the width of the scene and is filled with ice. In the foreground is an aufeis mound. On the left of the mound are spots where liquid water flowed out. This mound is about 10 feet high. Here, the ice is opaque.

Sometimes, as here, the ice is transparent. Riverbed rocks have been lifted up by ice.

Clearly, the sun and concentric ring are the big elements in this scene. However, I added more interest by including ptarmigan tracks and the willows they feed on to the foreground. The bright spots appearing on the ring are called parhelia or sundogs. On this afternoon, the sky was blue, but there was a fog on the ground. A light wind was blowing which carried ice crystals. The fog is due to the ice crystals. Sundogs are created by sunlight interacting with ice crystals in the air. The next image is zoomed in on the upper right sundog.

The faint streaks of a few dozen ice crystals are visible here.

Here, Robert Thompson is pulling his cargo sled. A third person had joined us for this trip and is riding on the sled. I was on a second machine. In the background is a coastal bluff. We're traveling across a coastal lagoon bounded by the bluff and a barrier island.

This is one of our camps in 2007. A laptop won't run in these cold temperatures. So, on these trips I stored my images on hand-held, self-contained hard disks. I needed to warm up these hard disks inside my parka for 15-20 minutes before turning them on. Then, I'd spend 20-40 minutes downloading my images taken during the day. I needed to do all of this while standing outside of the tent. Inside the tent, Robert was melting blocks of ice on the stove for cooking. Melting snow and ice in a tent creates very humid conditions. The large and quick change in humidity isn't good for some electronic equipment, so I stand outside.

This is a camp in 2009. Again, Robert towed his cargo sled. Here, the unloaded sled is on its side at the back of the tent to act as a windbreak. The main reason to be out in these conditions is the hope to capture images such as…

The glory of the coastal plain and Brooks Mountains in their winter coat. The foreground is a riverbed filled with aufeis.

A near-monochromatic view of a distant knoll and dappled clouds and sunlight.

Beautifully-sculpted sastrugi.

More sastrugi.

Sunset on the coastal plain. The frozen ocean is about 17 miles in the distance.

Rivers on the coastal plain flow from the Brooks Mountains northward to the Arctic Ocean, and perpendicular to the prevailing east-west coastal winds. Because of this perpendicular relationship, snow accumulates across river bluffs, forming deep drifts. These drifts along bluffs, such as in this scene, provide denning sites for polar bears. The density of polar bear dens in the refuge is the highest of anywhere in Alaska. In this scene, the strong shadows cast by the bluff tell us that the sun is out. However, there is a haze or fog in the distance. As with the sundogs image, ice crystals are being carried by the wind. The bright spot in the lower right corner is a sun-reflecting crystal. Other crystals are faintly visible against the bluff's shadows.

Many people are surprised to learn that the refuge is not frozen year round. Instead, it is rich with the colors of plant growth. This color palette is a pleasing mix of warm plants and cool water blues.

11:30pm looking north from the foothills at the Arctic Ocean, which is the blue thin line on the middle right. This is a rather iconic image of the midnight sun shining across wide tundra.

A drainage on the coastal plain. Another diagonal.

Wolverine tracks near a river.

Here, a grizzly bear has dug up a ground squirrel tunnel in search of a meal. This is a favorite of mine, in part because of the story it tells. The story is that while this landscape can appear stark, it is enough to support one of North America's largest predators. The angle of the ripped-open tunnel, the shallow groove in the soil, and the plant growth patterns off to the sides all point off into the distance. These encourage you to want to go explore.

An aspect of the refuge that I find amazing is the abundance of life at any scale. Here, right beneath my feet, is a rich assemblage of plants and lichens. In fact, this entire scene is covered with life except for a small rock near mid-bottom.

The black in this scene, and much of the gray and white, are different species of lichens, as are the yellow and orange.

Seasons change quickly in the Arctic. This is the first week of August—contrast the color of the vegetation here with next picture taken in the last few days of August.

In just three and a half weeks, the vegetation has gone from its rich summer color to full-on fall.

Sunrise in early September; Notice how the curve in the cloud complements the curve in the land. During nighttime hours now, the sun is below the horizon enough for the stars to be out again.

The fifth eco-zone is Arctic coastline, shown here in blue.

Midnight in early July; at the bottom of this scene are the remains of sea ice in the waters just off the beach. This view captures a bit of the coast, the coastal plain, and the distant mountains. The Arctic coast includes marshes, deltas, and lagoons which are habitats for fish, birds, and marine mammals.

The Arctic Ocean is about 100 feet behind me. In the foreground are brackish ponds. The scattered driftwood is from Canada. Near-shore currents carry it west into Alaska.

The Arctic coastline eco-zone includes barrier islands such as shown here. To the far left is the mainland; in between is an example of the lagoons I've mentioned.

Here's a close up of one island with its lovely sand tendrils or filagree.

On the right is a coastal bluff, a lagoon on the left. The barrier island is out of view to the left.

So here, Robert and I are looking south from the ice on the open ocean. The icy surface looks like frozen waves. On the horizon to the far right is the black line of a barrier island. The sun has just set, leaving a soft glow on the ice.

That completes our eco-zone journey.

Science and psychology are beginning to discover the values and benefits of nature to the human psyche. For example, several years ago researchers found that the type of landscape people find most soothing and appealing is one of vistas, pockets of trees, and near water. The Arctic Refuge is full of this kind of landscape. Author Gretel Ehrlich says that humans need beauty like they need oxygen. I like this and believe that, over time, research will show that beauty is as important to our well-being as eating and reproduction.

Again, people want wild places to exist because wilderness reminds us that we're part of something much larger than ourselves. People want wild places to be healthy, vital, and free of interference of our modern society, of us. The choices we make in our everyday lives, what is my carbon footprint, what other choices am I making as a consumer, directly determines what wild places will be. I like what Roderick Nash has written: he says that wilderness can become the symbol or our restraint and our sustainability. So, I leave you with an image that is not in the tradition of riding off into the sunset, but of a sunrise—a symbol of our shared hope for the future.

Thank you.

Bob Krear

Sheenjek Expedition, 1956. Olaus and Mardy Murie in camp with Noel Wien, who started Alaska's Wien Airplines.

Forrest McCarthy: "Land Cover Change in Arctic Alaska"

Tom Veltre

George Schaller and Forrest McCarthy Arctic NWR 2006.

I was at the University of Wyoming doing wolverine research and I got a call from Jon Waterman saying, "Hey, you know, we're doing this 50th Anniversary expedition to the Arctic Refuge this coming summer. Would you like to be a part of that?" And I had already kind of started down a process at that time, you know… "But to do that, we really want you to do some kind of research project." And, you know, at that point I was already going down and doing some wolverine work. But how do you say no to an opportunity like that, which was truly a gift?

I got invited. Primarily, I was a non-traditional student: I was already in my 30s, decided on a career change, and was back at the University of Wyoming. I'd been working as a guide in the Tetons for many years, where I'd gotten to know Mardy Murie a little bit, trying to educate myself a little bit more in the natural environment that I was working and living in. I had taken courses at the Science School when the Murie Center had formed, and Nancy Shea, the original executive director, was a friend of mine. Alaska is actually one of my favorite places; I've spent time up there every year for 14 years now. And so, it was a great opportunity.

I was not a wildlife major, I was a geography major. I was kind of trying to connect together how, you know, what could be a cool research project, and physical geography is what interests me. At the time, climate change was really beginning to get big in academia, a lot of stuff was going on. I loved the idea of a historical component, going back and looking at what the Arctic looked like 50 years ago, and, in some cases, even over 100 years ago, and looking at what it looks like today.

And also 2006 was just like celebrating 50 years of the refuge; it was a celebration of 50 years since the 1956 Sheenjek Expedition. And George Schaller, in a conversation with Nancy Shea at the Murie Center, had launched the idea of doing an anniversary expedition. In keeping true to that expedition in '56, they wanted to keep it really small and they wanted to have just three graduate students; I got chosen as one of those three graduate students.

It was truly a gift. I got to meet George, and we spent the summer of 2006 together up in the refuge traveling all around, a little bit more mobile than they were in '56.

The Arctic is unique in its biota landscapes: the effects of extreme annual variations and insulation and temperature have driven the development of unique species, ecosystems, landscapes, and hydraulic processes. It is really a unique place.

My research objective: By comparing historic photos to contemporary photos of the exact geographic location, changes in the arctic land cover can be assessed. Photo pairs of historic and contemporary images can be created and compared in an effort to detect visible changes in the diversity of arctic land cover types. The land cover types that I focused on were glaciers, aufeis, river channels, ponds, lakes, tundra, shrubs, and trees. I had three basic areas: the Dietrich's Fork, just on the western boundary of the Refuge; F.C. Schrader from a USGS Survey in 1989 had… there'd been some photos there. I went down and spent some time in the archives in Denver. And then Ernest Leffingwell, up on the Canning River, had been in that area about 1910. And then, of course, there was "Area C," the upper Sheenjek Valley.

Repeat photography is a simple and valid method for documenting environmental change. The methodology involves acquiring historic photographs, locating the site of historical photographs, re-occupying the original camera position, and making a new photograph of the same scene. This allows direct, versus inferred, comparison of changes on the landscape that may have occurred through time.

So, I kind of was able to group things into a 50-year time lapse and a 100-year time lapse.

The most fun part of it, for me, was getting on the ground and actually running around trying to figure out where these original photographs were taken. It was like pulling teeth, getting George to actually send me some photos of some of the upper Sheenjek Valley. He sent me one of the Sheenjek Glacier and it just said, "Sheenjek Glacier." I pored all over the maps, and there was nothing on the maps that said Sheenjek Glacier. I actually sent it to Matt Nolan and I was like, "Do you have any idea where this is?" And he said, "No, I don't, but it's probably not there anymore." But whatever… I talked to George later on and he said, "Well, we didn't have GPS back then." And, to be honest, they didn't even have decent maps back then, so a lot of these sites were really hard to figure out where they were. And I've had a lot of fun being able to use Google Earth and look at the images and get kind of a rough idea where they were, and then getting on the ground and actually running around and finding them.

The coolest thing was the Leffingwell's. He actually left a cairn, so this cairn up in the Canning River that Leffingwell built and left is still there.

And so, in 2005, when I started in this project, the Arctic Climate Impact Assessment had just come out, which is a synthesis of a lot of what was known on climate and change in the Arctic. A lot of my research really is not so much original research; it was more a lot of predictions and modeling done on this thing, and to see if those changes were occurring on the Arctic, then going out and actually repeating some of the methodology some of the researchers have used, like Matt Udall with the glaciers, and Matt Sturm, and Ken Tape, and some of the other people; going back and duplicating the research and seeing if we would find similar results in some different places as far as changes in the landscape.

Most of the people are probably familiar with the famous "hockey-stick" graph with the climate change in the Northern Hemisphere. Climate change is more pronounced in polar regions as well as alpine regions, and so the arctic area is one of the areas being affected the most.

McCall Glacier, in about a 50-year time lapse from a Post photo in 1958, has receded in the last 50 years. I went out and followed George's route that he had done when he went on his walkabout, really an impressive trip back in '56, when he left for those 9 days from Last Lake. We really weren't sure where he went; the maps weren't really good back then and it had been a while, and of course he didn't have GPS. We used to sit in the mornings, and he had his journal, and I had all the more contemporary USGS maps, and we'd sit there and figure it out and retrace his map by reading his journal every morning, where exactly he had gone. I followed about half of it; I actually dropped over the crest and then floated down out to Kaktovik, where he had gone over to Chandalar. We were walking all around, trying to figure out the exact spot that he had taken this photo, and I was trying to line up some the peaks in the background, and then Martin noticed these three. Of course, you can see where the terminus of the glacier, here, has receded significantly in the last 50 years. That is pretty much the truth with all the glaciers in the Brooks Range, they have all receded, and glaciers in Alaska, and throughout the world, for that matter.

Aufeis, known as overflow ice, is usually associated with fault lines within the Brooks Range. A lot of spring water comes up throughout the season and freezes and forms these massive ice packs. It is kind of thought of more as an annual event, that it forms during the winter and melts away completely in summer, but there is a lot of evidence to show that some of those fields of aufeis actually persist through the summer. One of the prime examples I know is when George and Bob left Last Lake in '56, in August, there was still a massive field of aufeis just south of Last Lake. When I was there in the first week of July, 2006, that area where the little airstrip that most people use now when they land at Last Lake is formerly a field of aufeis. So it is still inconclusive, but it does appear that the aufeis, at least in the summer, is probably melting much faster, and there is less coverage overall.

We have also been dealing with changes in vegetation cover and shrubs driven by changes in climate and changes in precipitatio and melt off; the river channels are actually changing.

In some other places in the further west, in southern Alaska, there has been some documented movement of tree line. In none of my photographs was I able to find any actual changes in the movement of tree line. What I did find was that the trees were notably larger, and I did some counting of how many actual trees are in one spot, and it seems like they are more filled in.

The other noticeable difference is in changes in some of the ponds, lakes, and permafrost. There is a phenomenon called ice wedging where you get cracks in the permafrost, and then the water goes down into those ice wedges and freezes and expands those cracks, eventually penetrating down into the water table. There had been a pond in '56, and an area where there was some slope, and where the permafrost is actually well drained, and the ice wedges in that case most likely drained that lake. After having walked around and tried to find the exact locations of many of the photos from the '56 expedition, I am absolutely convinced Last Lake is much larger than it was 50 years ago. Some of the original sites of the photographs, I would have to be in a boat to get to the exact spot today, and they were taken from land. Last Lake is larger, and that is an area of permafrost that is not well drained, and so, if there is ice wedging, it may have gone down into the water table, and has actually resulted in Last Lake having more volume.

I know there are a couple of people that did some research up at Toolik Lake. They did a really cool experiment where they just altered the temperature of the tundra by about one degree Celsius. Just even that one degree, all of that small tundra shrub sprouted up over a meter high. The other place, too, the other thing notable about tundra is I also found a lot of photographs of areas that had previously been barren ground but are now all grown in.

To summarize my findings, glacier and aufeis cover has decreased. In all scenes displaying glacier or aufeis, a decrease in cover is visible. In the majority, 68%, of these scenes, lake and pond cover displays an increase or decrease; some type of change was visible. In photo pairs with a 50-year time lapse, three times as many scenes display a decrease than an increase in river channel cover. In photo pairs with 100-year time lapse, twice as many scenes display a decrease than an increase in river channel cover. That actually does indicate that most of those changes happened within the last 50 years, which would match up with or correlate with changes in climate. The majority of visible changes in tundra, shrub, and tree cover display an increase in cover; increased tundra and shrub cover was more common in photo pairs within the last 100 years, the 100-year time lapse. The response of land cover is consistent with other known warming trends and other research, in which the character of visible land cover indicates a landscape-wide response to observed changes in the arctic climate.

That's kind of the abbreviated version of my research. One of the visions for the refuge was to have a place where we could go do science and observe what natural processes were like. It's not lost on me that, had not Olaus Murie and Bob Marshall and these people set this place aside, a lot of the research like mine, and these observations in places that have not been impacted directly by our activities, would not be possible. So, I feel really thankful for all these people that did such great work in setting this place aside for those reasons. Climate, from a wilderness preservation standpoint or conservation standpoint, is a really interesting subject because, even with this line around here, where we are not impacting that, even our activities and actions outside of this wilderness area are impacting this wilderness area. So, it's something I know I'm mindful of.

Bob Krear

Sheenjek Expedition, 1956. L-R Olaus Murie, William O. Douglas, Mardy Murie, Mrs. Mercedes Douglas in rubber raft on Last Lake.

Dr. Matt Nolan and Kristin Nolan: "The First 50 Years of Reseach on McCall Glacier"

You don't have to be a glaciologist to see that a lot of ice is gone, and that is what I think the power of repeat photographyis: that you do not need to be a scientist. It is hard to explain what is happening here without some kind of connection to climate. As a glaciologist, I know that these glaciers in the Arctic Refuge are some of the simplest glaciers in the world: they advance and retreat or stay the same purely at the mercy of climate. If climate changes, these glaciers have to respond to it. Conversely, the only things that these glaciers are responding to is a change in climate, so when you see them changing, you know that something has changed about climate to make that happen.

A year after the infamous Sheenjek trip, there was a year-and-a-half-long project that started in the spring of '57 through the fall of '58. These two groups, the sort of south-side ecologists and the north-side physical scientists, never connected; I do not think they even knew about each other at the time. One of the things I hope to do is to try and make a tighter connection between the physical scientists and ecological scientists. There are some interesting, though obscure, non-intuitive linkages between it all.

The first real point to take home is that these glaciers in the Arctic Refuge are unique in the sense that they exert strong controls on downstream fish and bird ecology. This is unlike glaciers anywhere else in arctic Alaska, certainly. The second point is, if you were to poll a glaciologist and say, "What is the number one valley glacier research program in the world?" I bet you would find that number one ranks - if not number one, certainly number two or three—that this is world-class glaciology going on here in terms of its breadth, its depth, and its length of history. The fact that it's happening essentially in the middle of nowhere, one of the hardest places on earth to get to, is a remarkable accomplishment that everyone here should be proud of. To see those linkages between glaciers and ecology is not an obvious thing. That's sort of what the third theme is; it's just to end with a question, so we know, as a family and as a group of scientists, what we need to do to keep the project going. We are maybe a big piece of the pie, but we're not the whole pie, you know. There are a lot of stakeholders involved here, from scientists to managers to politics, and a lot of that's represented here. I just want to ask that question to you, if you see value in what we've done and seek to predict sort of similar value in the future. What can we do to make this project survive in the long term? Because it's been a real struggle; we never had had long term funding; it's always been one- to three-year grants stacked back to back, often with gaps. So, the efficiency and the value would be enhanced if we could somehow pull this off in a more robust way.

If you don't know about Leffingwell, you are missing a big piece of the refuge story. He predated all the refuge political stuff. He was wandering around out there from 1904 or '05 to 1910 or so doing amazing things. He is the field scientist that I think most field scientists aspire to be: very broad, great breadth, great depth, and personal dedication to a job.

Okpilak Glacier is the largest glacier in the Brooks Range. He wandered back there in 1907 and took this series of photos. At the turn of the century, these glaciers all over the Brooks Range were filling the moraines that they had at that time. And it's not just the big glaciers, but the small glaciers, too. These glaciers, big and small, are all retreating, and I'm going to put some numbers to that in a few minutes.

Snow makes glaciers grow. If you take away nothing else from this, take that home. Snow makes glaciers grow; without snow, glaciers can't grow, and they have to retreat. This is a problem. To maintain the glacier size, if the snow is not accumulating, left over from the previous winter, there's nothing left to balance what's melted in summer. When the glacier is losing more than it's gaining, it loses from storage, and then it's gone, and that's it. I mean, it can certainly come back, but, you know, it's like getting a new job or something.

Okpilak Glacier is the biggest glacier in the Brooks Range. Most of the glaciers in the Brooks Range are weird shapes and sizes, just sort of clinging to life on the side of a valley, little glaciers just draped over the peaks, all shapes and sizes. The other thing you start to see in the bigger ones is these nice, beautiful moraines, just like on Okpilak. We know now it only takes a century or two of slightly warmer weather to make these glaciers disappear, which is the process that's happening now. Conversely it only takes a couple of centuries of slightly colder weather to make them reappear. So, it's dynamic, though somewhat slow-paced; it's not like a caribou migration kind of "Ooh! Ah!." But, if you look at it over the long term, it's the same sort of thing, where

these glaciers are, in a sense, living. There's a dynamic involved here that it takes some time to really register.

So, these are not the monsters that you see in the Southeast: if all of the glaciers here melted tomorrow, like, completely, sea level wouldn't be affected at all; you couldn't even measure it, it's that small. But ecology is affected.

These valleys here are roughly the same slope, the same height; yet, the north-facing valley is covered with ice, and the south-facing side of the valley isn't. So, solar aspect plays a really important role in where glaciers are and the distributions of glaciers. This is one of the reasons why most of the glacier melt-water flows north. So, we study this numerically in terms of understanding the effect of sunshine, and essentially, roughly 75% of the melt energy that's going towards summer melt in these glaciers is coming from the net radiation balance, the energy flux at the surface. So, air temperature itself plays a relatively minor role, 15% to 20%. But air temperature, for a variety of reasons, mimics the net radiation balance very closely. So, changes in sunshine are very important, and, in some sense, more important than changes in air temperature. This gets to be an important hot point for some of our studies.

So, getting back to the first take-home message, as everyone here knows, I'm sure, when the Brooks Range goes to the east, it swings far to the north. We are talking about a geographic thing here, where the smallest watersheds in arctic Alaska—the Hulahula, the Aichilik, and the Jago—they're only 50 miles from the mountains to the coast, whereas the Kuparuk are orders of magnitude larger. That's one part of the arithmetic; the other is the mountains here are higher, and there's a moisture source close enough that they generate glacier. So, higher mountains are colder, which is more favorable to glacier formation. So, the ice within the wilderness area of the refuge is… I haven't actually added this up, but I suspect there's a lot more ice here than adding all this up together. These are really tiny little glaciers; these are from the USGS maps, so they don't represent the size, just the location. So, what you have are the smallest watersheds with the most glaciers.

The watersheds themselves are the most heavily-glaciated, glacier-dominated watersheds in arctic Alaska. This plays a role, then, in the downstream ecology. The biggest part of that reason is this sort of textbook arctic hydrograph: looking at one summer snowmelt, you have a winter's worth of snowmelt built up, and it melts in a couple weeks period. That creates a dominant hydrological event every year by far. After that, it's basically just rain or snow, and then snowmelt throughout the summer. If it wasn't for those rain events, you'd get down to almost nothing, and this "almost" part is basically base flow from springs. There're a lot of springs in the North Slope from water entering on the south side and bubbling up; how much that occurs in each watershed is sort of a matter of luck. There are a lot of arctic rivers and certainly streams that go dry completely in summer.

The coastal plain melts next, and then the mountains melt last. Once the snow in the mountains is gone and the spring freshet is over, there's not much. These guys dry up very quickly in summer; the rivers are not that big and there is just no water left. It is almost a desert up here in a lot of ways.

During the summers, it rains, but when it rains on the tundra, there is this sponge that is a meter thick. It just literally soaks up most of that moisture, so 80% or 90% of these rainfalls in the tundra never make it to a river. Rain or snow in the mountains during summer will create pretty big floods because there you have steep gradients, so the water has a tendency to want to flow faster on permeable surfaces. A rainfall in the mountain will create a decent-sized flood. It is spring or glacier melt, and glacier melt is something not to be ignored when you are looking at the water budget of these watersheds. You are losing that much ice per day over the surface of a glacier that's six or eight square kilometers; that turns out to be a pretty big flood. And you know, I can tell you from a lot of personal experience that you really have to watch your step. It's a big enough river that it is a little bit intimidating; it has nothing to do with carrying a child on your back while you're doing it.

The Jago River Valley has all these glaciers coming into it, and this is the result: this is a mid-summer photo where you have big river here. It is crossable, but it is big and it is filled with silt. Here are the two things: you get a lot of fresh water and a lot of silt entering this river system. And this is different than everywhere else essentially, and the fish know this, right? The fish come preferentially—and I'm not a fish guy, so I can say this without fear of abuse, because it's not my thing—the fish come here preferentially because the waters open. They leave here in June during the flood, and these are Dolly Varden, this is the Hulahula River here, and they come back in late July. They can do this because there is enough water here. There are also some big springs in the Hulahula, so they have these overwintering fishing holes. This is a subsistence use area on the Hulahula, because if the fish are there, people are going to figure it out, whether they are sport fishermen or subsistence users. Then, the boaters are going to figure it out as well, because the rivers here are big enough to float because of glacier influence. And that's really the take-home point. And some people even find it a little challenging to float these rivers, but everyone has a good time; they're not that deep in the end, so…

What is critical about glacier input is the water coming out of the stream. McCall Glacier comes through this valley and then hits the river and it never leaves. It's not like overland flow in the tundra, it's like a point source: you have all these point sources contributing and staying within that channel to keep the rivers open. The water and the silt makes its way to the coast, makes these nice beautiful deltas, Hulahula and Okpilak. These deltas are different than deltas elsewhere because they're filled with fresh water, more so than all the other deltas to the east or west, and they've got this silt. And that's one of the key things, because this glacier grind-up silt, that sediment-sized distribution of these deltas, is different than elsewhere; they're sandier elsewhere. The birds like to come because there's better food, essentially freshwater invertebrates, and when the birds show up, you know, biologists show up to look at them; you can't turn around without bumping into one of these guys.

The freshwater invertebrates are different than the saltwater-loving invertebrates, and the birds know this; the birds get fatter faster, they come to eat because the food is good. And the food is good here because glaciers are contributing to these deltas and they're not doing that elsewhere.

So this is a study by a bunch of UA folks looking at the Hulahula and Jago area compared to, like, the Canning, which is a non-glaciated watershed. And that's where these results come from.

This is one way that we can come together as a group and follow, really implement, the vision of the founders of the refuge, to look at the whole system as a system, and look at all the component parts.

This glacier story is one of the most clear and compelling climate change stories in the Arctic that I know of. You have big glaciers melting a lot, opening up these rivers. Fish know that, birds know that, their ecosystem trajectories and life histories are being altered or evolving to the fact that these glaciers are there. Those glaciers are going to melt and they're going to be gone in 25, 50, 75 years. When that happens, these rivers are going to change: the amount of freshwater, the amount of silt, it's going to change. That has to affect these fish and these birds in ways that I don't know or understand. But this is something that's straightforward; I won't say easy, but it's straightforward to study and to hypothesize and put plans together about.

One of my personal heroes in the refuge is this guy named Dick Hubley. The McCall Glacier Project was his brainchild in '57. This is during the "Third Annual Polar Year," or the International Geophysical Year as it's called in '57, and this is at a time when glaciology was in its infancy, but there were a lot of wacky ideas about how glaciers worked at that time. The seminal papers on glacier flow and dynamics were only written in the '50, so Dick was way ahead of his time in saying, "Well, look, if the glacier's changing, something is causing that related to climate. We should be able to build a transfer function between those two that would go either direction." And he was really the leader in terms of setting up weather stations to understand the micrometeorology, how to take the big-scale down to the smaller-scale weather. How do you transfer that mass energy across the surface, and what then happens to the glacier? So, what we're doing now is really just finishing or evolving from the dream that he started, so in some sense we're more technicians in this regard than scientists.

There is great work by Darrell Kaufman and a cast of dozens pulling together all the arctic records they could find, like lake sediment cores and dendrochronology, and over the past 2000 years there's been this cooling trend. They did some modeling, too: the orbital variation from the earth around the sun, changes in the amount of solar insulation hitting the planet or the Arctic has been changing and decreasing, and this should be driving a cooling trend—a cooling trend which should be continuing today—but, clearly, it's not. Sometime around the 1800s, not coincidentally, was the time that these glaciers started retreating in the Arctic; there was a big increase in air temperature. So, we want to explore what's going on there, and particularly what's happening in the Arctic, and we're trying to do that through ice coring.

The important point here, in terms of the context of what it takes to maintain a long-term weather station or a long-term research program, is I had tried several times to get an ice core project funded. But, basically, it was just laughed at because the ice core community comes from ice sheets—that's where you drill ice cores, you don't drill in valley glaciers, right? So, what I got funded was a project to make holes in the glacier to put instruments down. It's still a valid scientific project and state-of-the-art type stuff, but we're putting thermistor strings down these holes. We kept the ice and put our time into just using our own dime/funds to keep it, because we're coring, and that was no accident. We could have made hot water holes, just melted our way down.

So, there's this National Ice Core Lab in Denver where ice cores get reposited. Well, we didn't really have an ice core proposal funded; we just showed up there with this van and said, "You've got to take this ice or it's going to melt," essentially. And they were great, I mean, this was all a little bit odd for them, but they were very cool people; they understood.

We did this because we knew that these glaciers are going to disappear at some point, and if we don't core this now, we've already lost, because we're not accumulating snow anymore; the top of the ice where the core is being taken is melting away, so we need to do this now. And I'm not an ice core guy; you specialize a bit, and this is a very specialty, niche field. At this point we lost control of the ice. We turn it over to NICL, and I don't

have any say what happens to the ice; people can just show up and cut it up, there's some other committee that deals with that. But for us, for this project, we've always had a very open, data-sharing, collaboration thing, and I felt I don't need to get the credit for doing this because I don't know what to do with it anyway. But I wanted to get it there. I think that was the key thing.

And this strategy worked great. A week later we flew it to Joe McConnell in Reno, and he did the same thing, he felt the same way. He's got the fanciest machine in the world in terms of ice cores. We cut the ice up into these sticks; it comes in a circular chunk and you cut into a rectangular thing about this size. You feed that into this machine here, there's a hot plate right down here that melts the ice, and gravity just brings it down. All the melt water then gets sucked off by these tubes to machines that go "biz" and "whir" and "ding," and voila! You've got 40 proxies for atmospheric, pollutant transport, and climate information, 40 different chemical proxies measured continuously throughout this core. He did this on his own. We did all this basically to justify our real proposal and say, "Look, guys, I mean, all the risk is gone. We already extracted the core, we've already run it through the machine. We've got good results, or, you know, results. Now we just need money to analyze it." Fortunately we've got that funded now through NSF just this past fall. So, we actually just started this project. Our first PI meeting was a month ago.

Banging out of the machine, these red lines are annual signals. There're a lot of reasons why people don't core valley glaciers, and one of them relates to this. There's an exclamation point there for a reason; this was a big deal for us. This is, like, corks coming off the champagne bottles kind of thing. So, there's annual signals, but do they mean anything? I mean, this could just be garbage that's got a signal fluctuation. Joe again comes to the rescue: he's developing this network of cores and, since getting the McCall results, he's been able to go and core a couple other valley glaciers, which weren't as successful, in a lot of ways, as ours, but it's still ongoing work.

So, I'm just going to show you some comparisons now between one of the Greenland glaciers and McCall to point towards the global significance of this, and the fact that these annual signals are real. So, the red line is McCall information. You're looking at about 200 years of stuff; this is looking at the lead concentration. This Humboldt Glacier core is in black, and what you see here is the variations are very similar, and this is exactly what we hoped for: that the variations are similar, but they're not the same. Because it's geography, you know, it's location, location, location. McCall is unique for this kind of application, not because the ice is somehow special, but because it is where it is. As you saw on this map, there's really nothing else in this region, certainly in the Arctic, where it can be able to do this. So, one of the ways they're similar is you see in the '70s, after the following of the Clean Air Act, both records show that due to the, you know, "let's switch from leaded to unleaded gas" in North America and Europe, and similar legislation in Europe, both cores record this great reduction in lead, which is a fantastic achievement. What the McCall core records and Greenland doesn't is a sharp rise in the past 20 to 30 years, and the difference again is location: this is due to the proximity to Asia and Armali. And our isotope work shows that this is stuff blowing over arctic Alaska and landing on our glaciers and on our refuge; that we're not, I mean, not that it should matter anyway, but you know we're not producing this. The Greenland core doesn't show this, again because of proximity. So, this is a way that I think McCall plays an important global role. Even though the melt water itself doesn't affect level, I think in the very short term future, we're actually going to hear some really interesting things.

And Joe asked me not to show this slide, but he's not here, and I'm not actually going to show it because I promised I wouldn't. This is the same slide from Humboldt Glacier that we have for McCall Glacier, but McCall's more interesting. I'm not going say exactly why, but you'll get the point.

So, he's developed a really neat trick; soot is important because soot is this black stuff that lands on the glacier, it changes the albedo, changes the surface energy balance, melts the glaciers faster. That doesn't matter really on McCall because it's so small, but on the Greenland ice sheet this is a big deal, and on sea ice as well. So, he's compared vanillic acid, which is a marker of biomass burning—agricultural, forest fires, that kind of stuff—versus black carbon, which is an industrial soot measurement. For the first part of the record through the late 1800s, those two track identically, basically, so there was almost no industrial input here. After the late 1800s, the story is a lot different. The two curves diverge significantly. So, now you see this industrial input is gigantic; the biomass burning is roughly at the same level, a bit higher, there was a lot more agricultural burning. Then, sometime in the late '50s, with the [unclear], and the steel industry, and changes from coal to diesel, and this kind of thing, again this is the Greenland core. So, this is looking at European and North American atmosphere. We see that it's gray, soot has come down quite a bit; it's not back to the background levels, but it's better. So, this is the Greenland record. All I can say is McCall's record shows something much different, for reasons I alluded to before, and, hopefully in the next month or two, you'll see something about that in "Nature," but that remains to be seen.

So, just getting back to this great figure, McCall Glacier covers, captures this transition that we're so interested in. We know that, with the bottom age of the core, we're going to see this transitioning happening, both in terms of industrial pollutants and climate change. But, like I said, we just started this project, so we're excited, but we don't really have much more than that to show at the moment.

I'm just going to touch just a quick point on each of the ones below, just to give you some flavor for it. Of course, we have a lot of atmospheric modeling going on as well, but we want to know what happens on the glacier itself. I call it local weather rather than local climate. We have these weather stations; if you talk to an atmospheric guy, they'd say it takes decades before weather turns into climate because the inter-annual variability in weather is huge. You can have hot summers and cold summers and it means nothing; you really have to look at long-term trends. And this is one of the key value points of McCall Glacier, that there're no other weather stations anywhere in the refuge. And this is a problem; we all want that information, but it's a wilderness area, and there're others who're associated with it. But McCall, because of this history that predates the formation of the refuge and all the data that's come along, is the spot for long-term climate trends or weather trends.

So, we've been doing this since 2003; that's when we started the project, when we had these weather stations. We're not quite at the climate level yet; Turner's got to get closer up to my height before our weather station data is going to turn into climate data.

I mentioned about that project, too, a little bit about the history; these guys are out there from '57 through '58. We're making the same measurements that they were; we just have a much easier time of it in a lot of ways. This is when I first really realized where the word data logger came from: at this time in the '50s, those guys were the loggers. Now when we think of a data logger, we think of a little box that's electronics and stuff, but not them. They had to wake up, someone had to be awake through the night to make these measurements.

In the '70s things got a little easier, although it was still cumbersome. This is one of their main base camps here, a little hut that's still there, though it's much more disheveled. Just to give some color, there's a generator there that was running, and a giant extension cord coming out to the glacier to power and record these instruments, and of course it was only there when somebody was able to feed the generator with gas. So, we are really lucky to be in a situation where there's all this electronics out there now. We just have access to this beautiful stuff. A couple hundred bucks and you get an old data logger that will run through the winter on double-A batteries. So, I've reoccupied all those same weather station locations and basically blanketed the glacier elsewhere with similar measurements.

This is our main weather station, but it's basically everything you'd want to know for a complete surface energy balance or measurement: four component radiation towers of temperature and wind, rain and snow, the whole works, testing out different instruments, et cetera. Up at 8,000 feet, we're capturing well into the mountain boundary layer. We've got numerous small ones; all of these are floating stations, so they just ride on the ice. As the ice melts, the bases widen, and so it kind of just melts down with it, so we're not out there having to reset it.

This is another important plot point: if we don't get funding, we have no way to get back there; most of these stations, a lot of them will work for two or three years without anyone being there, so that when we can get back out there, we're still bridging those gaps with good data.

Putting numbers to these long-term time series, to the pictures I was showing from Okpilak Glacier of this rise in snow line—I thought it would be better and more interesting to show it visually. Back in the '50s, the snow line was down here. In the '70s it was up here, and in the '90s it was up here, and now it's just this little pocket right there, right around where our core was. And often, the snow line is actually above the top of the glacier. So, we have these stakes in the ice and we measure and see if there's more or less snow accumulated versus the height of the pole, and then measure the top of the pole with the GPS. You can fool around with those pictures outside and see the same thing. But the point is, the snow line is rising, and this is what's driving the retreat of these glaciers. And again, I don't know of any other glacier in the world that's got as dense of a stake network as we have in McCall, and when you start to add all these things up together, I don't think you'll find a glacier that's got such breadth and such depth over such a long time.

So all of this, of course, causes the glacier to respond. All I'm going to say here is in 2003, we started using GPS for the first time, and we've never come back. So, we've taken the local optical networks and converted them into real-world coordinates, and now we're able to do some amazing things, things that Dick Hubley never dreamed of: short-term motion studies, spatial studies, temporal studies.

So, what we're looking at is seasonal velocities: this is summer speeds and winter speeds of a particular stake. You're not going to find a better correlation in nature than when the surface melts harder, like on a hot sunny day, and melt water goes to the bottom of the glaciers and makes it move faster; it's more or less a one-to-one correlation. And this is some radar stuff, but we know more about the temperature and velocity of McCall Glacier than any other valley glacier in the world; I'm fairly positive of that.

Another big thing we did from 2008 through now, actually starting in 2001, is we've measured almost all the glaciers in the Brooks Range and made new topographic maps of all of them. And in 2008 we started concentrating mostly here. So, in 2008, 2009, and 2010, we made new airborne LIDAR maps of all these glaciers, and this, again, is world-class. And we only had funding for the 2008 acquisition, but due to some technical glitches, the contractor couldn't quite meet the specs that we delivered. They had to do it again in 2009, and the same thing happened in 2010, so they're going to do it again in 2011. But it's not so bad that we can't use the data, it's beautiful data; it's just business, you know.

So, just to put a number on it, McCall Glacier is kind of an outlier in terms of glacier size: most of the glaciers are only one or two square kilometers in size, McCall is six or seven, and Okpilak is that guy there. But all of them are showing volume loss. So, this is a histogram of volume loss, with a median of about half of a meter. So, that's losing this much ice over the surface of all the glaciers in the refuge in a given year, and this is a 50-year interval, roughly. If you look at a shorter time series, or shorter time intervals, what you see for McCall, starting in the '50s and '60s, we're losing 15 centimeters a year, and then in the '70s it's 30 centimeters a year, and then in the '90s it's 50 centimeters a year, and now we're losing a meter a year. The rate of change, the rate of loss out here is accelerating with time; these glaciers are being driven further from equilibrium. At this rate, McCall Glacier's average thickness is only about 70 meters., so you can do the math, you don't need a sophisticated model; we're looking at 75 years. McCall is one of the biggest, so the other ones presumably have a shorter time, a shorter life.

I just had to throw this in because I'm really into map-making and maps and stuff, but this is McCall, the outline, flowing north. The colors indicate loss between one-year intervals, this LIDAR data, so red means roughly a meter of loss, and blue is zero loss or slightly to gain. So, I just zoomed into a part of it just to show you some of the awesome detail; like I said, I've got about 60 mass balance stakes out there, and there is a lot of heterogeneity. This is the equivalent of, I don't know, but it's like a million mass balance stakes, this is one meter pixel size, the size of this podium, that we have surface topography information for in multiple intervals throughout the past few years. Here's a surface stream, this is another hanging glacier, there's a very steep wall right here. You can see the stream is cutting through the moraine right here; the glacier kind of comes likes this, and there's a stream that runs along the margin. Here, it goes over a little hill and it flows out onto the surface. You can see ice, this 5 or 10 centimeters of surface accumulation of that stream, spilling out and re-freezing on the surface of the glacier. There's tremendous detail here; this is going to take another proposal just get at the heart, to get a start on what we have available here.

As a side note, some of you may know there's some discrepancy in the topographic maps about what the biggest mountain in the Arctic is. I had to pull that out because there's just not enough time, but if you want to ask me later over a beer, I'm happy to talk about it and show you the figure.

Getting back to Hubley's dream, that's where all this data is feeding into: what we've done is create what is the most sophisticated numerical ice flow model around; again, this is not my thing either, there's a great modeling guy who's been involved with the project almost since the beginning handling all of this, as there are with many other parts. But a full 3D model that's thermomechanical, so it handles all the ice temperatures; all these data you saw are either inputs or validation for this small glacier, and it's way over-constrained. So, we get ice temperatures; this is basal temperature, where we know it's warm at the bed. The same model is helping us to understand the depth-age relationship in our core.

The Muries are sort of the ecological heroes; well, Dick is one of the glaciological heroes, and we're very proud to be sort of putting his dream into place. He tragically died on the glacier in 1957, and he was unable, of course, then, to put his dream into practice. So, we're now able to do that finally over these past few years; things are really starting to come together, and I'm very happy about that.

So, this is it, I just wanted to give you a little flavor of what it has taken for us, and what this glacier means to us as a site that's different probably, from the ones you're used to. And here I'm really not talking about money at all; I'm talking about how can we all get on the same page. There're a lot of potential stakeholders in this room that could be involved with this project, and this is one of our goals for coming here, too: to make these linkages stronger. The '50s and even the '70s were a much different time for scientists. We've spent a lot of time out there, and we've taken a very special bond to the place.

In the '50s and the '70s, literally hundreds of tons of scientific gear, mostly fuel, were dropped onto the glacier, and there was no plan for taking it out. So, when we showed up, there were tons of barrels, things like that, leaking batteries and crap and junk. So, we put a lot of time and effort into it, and try to find the funding to get this stuff out of there, and at this point, you'll find there's still stuff always melting out of the ice, but you won't find any large debris. Some people will kind of be like "Ugh, what's all of this?" But, compared to what it was, we've flown tons and tons and tons of junk out of there, and we're pretty happy; that makes us feel really good.

A lot of this came from this moraine, where you can see that hut and the person for scale there. During IGY in '57, the glacier was about right here, so they just walked off the ice to this hut; they actually had a slightly different hut at that time. Now, this is the most treacherous part of the glaciers; these boulders are just perched here on ice. So, we wouldn't do it if we thought it was unsafe, but there's a lot of risk associated with

working and doing this kind of stuff, but we're happy to do that. Just as a side note, the IGY camp was left in place out in the accumulation area and got buried, so now there's tons of barrels and all kinds of piano and other things. That picture is from the inside of it.

So, sometime in the next 10 or 20 years, it's going to melt out. We have a strong commitment to outreach: we have near-daily blogs of all of our work out there, we're talking about something in the order of six man-years of effort from 2003 to now. I mentioned to you helicopters out there; we're not big fans of helicopters. We do have a very strong connection both to the wilderness values out there and, as a project manager, to safety and cost. So, we try as much as possible to use fixed-wing aircraft, and we do most of the time; in the past 3 years I think we've used a helicopter for about 20 hours out of probably three man-years of effort. So, it's really just for transportation to and from of heavy gear that we can't hike in with, and it's usually about a two-day hike to get in from the tundra via fixed-wing.

You see some of the photography out there; this is Jeff's coming from the artistic side towards the science, and I'm trying to come from the science side towards the artistic. And I can put on these "Mickey Mouse" art shows, where I mostly I just give photos away to people; I've got photos now in the White House and Congress and, as of a couple of days ago, maybe in Salazar's office, too. We've already talked about putting a few up here, just to get the word out. As Forrest has been saying, too, pictures just don't lie. You can't argue with it. For us, it's diversifying not only the scientific workload, but also the funding streams, through collaboration and open data sharing.

Finally, my Ph.D. advisor while working on different glaciers, Keith Echelmeyer, ran the project from 1993 through 2001, when he retired prematurely due to health reasons. In any case, when his funding ran out in '97, he had his own plane and just went out there and did it on his own to maintain these time series; that's the way it had been done before that, too, and we've embraced that. I'm not a pilot, I have no desire to be a pilot, so I married a bush pilot, and we bought some aircraft and now we're able to manage our own logistics as well. We've been lucky so far with funding, but when those gaps occur, that's what's we're going to have to do.

So, the point of that was just to say I think there's a way we can integrate our research, and that this is not just a UAF project, but a refuge project that everyone can feel some ownership in; we're very receptive to that. And we were flattered to be invited here. I just want to say, again, I'm sort of the front man, but this is very much a family project. We've learned a lot the past few days and we feel very privileged to be able to work out here, and we look forward to future collaborations and being part of the refuge story.

Sheenjek Expedition, 1956. Mardy Murie by tent in camp at Last Lake.

Tom Veltre: Film: Arctic segment of Nature's Greatest Defender

This is a real honor to be in front of you guys, it kind of looks like I'm addressing the U.N. with all the… And I'm not a scientist; when I worked at WCS, I ran the film and photography department, so I sort of always joked that I was the curator of show business. What we want to do is just tell some stories about our experience with George and making this little film.

The present title of the film is "Nature's Greatest Defender," which is not our original title, and both George and I sort of cringe when we hear that, but that was National Geographic's idea. Evidently, every time you put something on television it has to have a superlative in the title, or people won't broadcast it. Our original title, much more apt, was called "Nature's Greatest Defender: Witness to the Wild." To convince George to do the film, which took many years, to say, "No, George, we really want a film, and the film is not about you. The film is about all these places you've been and how they've changed since you were the first guy to study there." So, we went back to the Sheenjek 52 years afterwards. We went back to see mountain gorillas 50 years to the day that he started his studies there. We went back to see tigers in India 45 years after he was the first guy to do a comprehensive study there. We went to Brazil to see jaguars 30 years after he'd done the first really comprehensive study there. And just to see how the world had changed.

So, following in the theme here, it was a re-photography project. First, I did want to thank everybody in the Fairbanks office, and Jimmy Hawkes, Heather Knudsen, Janet; everybody there was so helpful for us. This was our visit to the office there, and Dave, for those of you who know him, two over from George is Dave Klein, just a sweetheart of a man, and was a graduate student when George was an undergraduate in Fairbanks.

What an exciting experience to go back and see things that weren't there when George was there in the '50s. There's our crew getting ready. There were a lot of scenes that we shot. Originally, we were planning to have a two-hour movie, a 90-minute version, so we shot a lot more stuff then really ever made it into the film, including a very heart-felt scene where George had visited the pipeline area. What we did do was really based on the same brief photography stuff that Forrest was doing, and everybody else, and we did this in each country that we went to.

I like to structure films around a single iconic image and sort of work out from there, and for me this was the picture. This was George sitting on top of Camp Mountain in 1956, overlooking the Last Lake area. And we said, "Look, George, what we're going to do is go there, hike back up, and put you in the exact same spot." And we did. This worked better there, we continued that theme all the way around. We went to the Congo, actually Rwanda, and this is George in 1959, taking notes. We printed each one of these pictures out, 11x17, just cute little technical things, mounted on the and just went hiking with them. So we'd hike, set them down in one place, put George and line them up like that, and then have the camera tilt from one to the other. We called it our analog special effect, it was extremely low-tech and a lot of fun. And thanks to Amy Vedder, right here, who was there and took these pictures of our crew doing this. We did the same thing in Brazil, and to a lesser extent we did the same thing in India.

But it was really in Alaska that we had our greatest success with seeing the before and after, maybe because there're such great pictures from Bob and from Brina and from everybody else who was there in '56. Or maybe it's just because it got some of the biggest emotional reaction from everyone there. It was an interesting experience for us because it's the only place during our entire film where we were by ourselves; it was my crew of 3 and Forrest and George. Every other place we went to we stayed in tourist lodges; we were surrounded by people. Here, it was just our little group out there at Last Lake. We shot some scenes at camp. We went halfway up the mountain and did a whole scene about re-photography that you'll see in our clip, and then did a couple hours further hiking up and got to the top of the mountain. The very first take was actually about 100 yards from the top of the mountain. I'm going to show you the original uncut thumbnail version; this is a low-resolution copy that's just… I'll put it through my Avid machine. But it will give you a sense of exactly how really emotional of an experience it was for us to be there.

[Showing clip]

I mean, to my mind, it didn't get any better than that; that was just such a moving experience for us. It was one of the best days of shooting out of six months of work on five different continents. Then, of course, we're traveling with a geographer, who has to look at this picture… Let me see if I can get this one going…

[Showing clip]

At this point I think we'll roll the clip. What I have is a 12-minute excerpt from the 51-minute film, and it's basically all of our Alaska stuff, plus a little bit else thrown in. So, you'll see what we ended up doing with some of the footage and really the great tribute to it. The film is really framed; we started in Alaska and at the end we came back to it because, of all the places that George has worked on over the last half-century, it's still one of the ones that's closest to his heart, still one of the ones that's most demanding of attention and protection, and we really wanted to drive that home for our audience at the film festivals and the National Geographic audience. So, here you'll see about 12 minutes; there'll be a little dissolve in the middle when we cut from segment 1 to segment 5.

[Showing clip]

Thank you, and please urge everyone to come and see the whole film tonight. There're a lot of neat things; I just thought if we compressed all of the Arctic stuff into one little clip that this would really set off George's talk, which is coming up.

It is, in fact, my great privilege to introduce my friend and long time colleague, George Schaller.

One brief story that I always enjoy telling about George is I've known him for more than 25 years, but the first time I was really out in the field with him was in 1996. I was doing a film about the tiger research program for WCS, and all the Asian scientists for WCS were gathered in Nagarahole Park in India, and George was there as well. We spent several days hiking through the park, and I'm shooting footage of them; there's all the Indian scientists up front, and all the grad students and all the porters and George at the back of the line. And then I'd run up to the front again and I'd set down the camera; the Indian scientists, those grad students, the porters, and then George. After a couple of days of this, I really wanted a shot of our senior scientist up front leading the delegation and really showing them everything he knows and stuff. So, I go to George and say, "George, why don't you get up in the front of the line, the birding is so much better there." And he said, "No, it's all right, I don't need to." I said, "No really, George, I really want you to be at the front of the line because it'll be good for the shot." And he said, "No, no." And then he looked around and, in a very conspiratorial tone, he leaned over and he said, "It's okay, the ticks jump on the guys in the front." So, what I've learned from this is always stick with George.

Bob Krear

Sheenjek Expedition 1956. Olaus and Mardy Murie by float plane camp

Dr. George Schaller: "Arctic National Wildlife Refuge, 1956 and 2006"

It's an honor and a pleasure to talk to you, and I'm very grateful to the Fish and Wildlife Service for inviting me to this event. I also want to express my admiration to the Fish and Wildlife Service for having protected and managed the Arctic Refuge so well for 50 years, in spite of tremendous political pressure from some administrations, from some members of Congress, particularly the Alaskan delegation as well as the oil companies.

Now everyone's seen Tom Veltre's film, all the other lectures and slides and so forth, and there's nothing much left for me to say. But I was impressed with the wonderful play last night, and it brought back many good memories. Now, you heard my feelings about being with Olaus and Mardy Murie, and that they had a tremendous influence on my life, not only natural history, but particularly that you have a responsibility as a scientist, or anybody, to work on behalf of the environment. You have to do something beyond yourself, not just to sit back and watch the world go by. So, I am as much an advocate as a scientist, and today I will be very little science and a lot of advocates.

Back in 1960, of course, we were all jubilant when the Arctic Wildlife Range was established after so many organizations and people worked hard to do so. Then in 1980, we were equally jubilant when President Carter enlarged it into the Arctic Refuge, doubling the size to about 31,000 square miles.

Now back in 1960, I was quite naïve and idealistic; now, I'm still idealistic, but not quite as naïve. I thought that if the United States sets up a refuge, it is safe for the future. Well, you learn very fast that as soon as oil was discovered there was great pressure to move into the Coastal Plain of the Arctic Refuge to drill for oil. Now, the oil companies and some members of Congress were extremely adept at misrepresentation of the area; some would call it lies. They said the area is a barren wasteland, nothing but snow and ice, it's not worth anything, so no problem drilling.

Well, you can see the beautiful photographs like this one here, the ones all over the building, the films and others that have been shown to show that it's a place of great beauty and abundant life. And how do you get that to the public? Because most of the public still doesn't think about it as a beautiful area; it's a very small percentage of people who know what it is really like. So we all, everyone really has a responsibility to somehow communicate the special place that there is there.

And as a result of these misconceptions, we spent three decades fighting the proponents of plunder and pollution to try to save the area for the future because the drilling of oil in the Arctic slope will damage the heart of the whole area. You know, the "drill, baby, drill" mentality is still very widespread and loudly expressed in this country, and it bothers me. Here we have America's last great wilderness, yet people are willing to destroy it. Can we not save a fragment of nature in this country, this great country, without greed or comprise, just save it for itself because it is beautiful?

So, I hope very much that the Fish and Wildlife Service and its plan for the future of the place will strongly stress that the Coastal Plain should be made a Wilderness Area. Ed Markey, representative in Congress from Massachusetts, has, since 2001, every year submitted legislation to have the area declared a Wilderness Area, without success so far. Well, you almost in whatever way apply pressure wherever it counts to get this area finally safe.

Now, you've been told a lot of good reasons for saving that area, and one that's repeated all the time is wilderness. Well, you know, wilderness concept changes between cultures. We here, with exception of Sarah James, tend to think of wilderness as a big empty area with natural vegetation. Well, whether you're talking about the Arctic Refuge or the people in Amazon basin or the Tibetan nomads, just because they're not many people there doesn't mean it is wilderness. They don't think of it as wilderness, they think of it as their own home; it's a place you subsist. Yes, they have respect for the land, they have respect for nature, they have respect for knowledge, but their wilderness. People I set up on top of the mountain see I can see forever and it's wonderful. The symbolic nature of most local people is very specific; there are sacred sites, symbolic sites scattered all over the place, whether it's a mountain or a river or cave or whatever; certain animals are symbolic. So, their vision or concept of empty country, of wilderness, you see the same thing, but our internal values are quite different. And this is something one has to learn when dealing with a culture so one can get the help of local cultures to protect the area.

One word about research and science: we know very little about ecological processes. Just because there's thousands of papers on the area doesn't mean that you understand it. Even a seemingly simple system like the tundra we know very little about it, yet it is going to change very

fast with climate change. The thing to remember is that ecosystems change very rapidly, whereas species do not. Back during the height of the last ice age, the Pleistocene glaciers went as far south as Indiana. Where are they now? The changes have been drastic in the ecosystems, but many of the species are still there. So, the species have a choice, they can either adapt, they can migrate away, or they can die. And it's going to be very interesting for ecologists in the future because our whole ideas of communities are going to be all different; the species have all shifted and mixed up where we never had them before. And so the Arctic Refuge is extraordinarily important as a place where all of this needs to be monitored in great detail, and not just once every 10 years; there need to be continuous monitoring stations of what is happening to the permafrost, to the soils, to the plants, to the small invertebrates, to everything if you're going to know what is going to happen, if you've got a model so you can predict.

But the one thing I think that always needs stressing, that this is our land, our voice, our actions, and it's up to us, everyone, to save places like the Arctic National Wildlife Refuge. You have to be involved or it will disappear. You know, I'm very aggravated and even aghast that so many would still be willing to destroy an area such as this; total lack of social responsibility, there's total lack of patriotism, to destroy something eternal for the expedient, just for a quick buck. Now we need to get that message out to everybody.

Now, I would like to show just a few slides of the 1956 and 2006 expeditions. There'll be nothing new, but it's always pleasant to look at beautiful countryside. I don't need to point out the refuge again. Back in 1952, I did my first trip to the Arctic there, and we went down the Colville River two times from the hills in the Brooks Range down to the Arctic Ocean, and we went in little collapsible canoes. One of our main purposes was to census the raptors, the hawks and falcons. This is Tom Cade, a well-known falconer and research biologist. And as I said, we went down twice. And these cliffs are very important because nearly all of them have hawk nests on them; I've never seen such density anywhere else. Tom wanted some birds to take home to train, so he got a couple of peregrines and a gyrfalcon, and they road along with us down the river. I figured, well, if he's going to have three pets, I should have at least one, so I selected a raven, and you can see where the raven roosts. But we had a wonderful trip.

George Schaller at Arctic (1956).

One of the purposes was to find out what Asiatic migrants occur in that whole region, birds like the red-spotted bluethroat and so forth. So it was a very pleasant journey down. There were many rough-legged hawk nests up there, and they eat everything, particularly hares and ground squirrels and so forth. And I found it very interesting that Canada geese nest up high on cliffs in abandoned nests. And so it's quite a jump for a little bird that can't fly to get off a cliff.

This is Umiat on the Colville River, that's the first oil exploration camp in the area. That's all there was, some few Quonset huts then. I'll show you some pictures later of what has happened in the meantime.

But now let's go to the Sheenjek; just a couple of scenic pictures to show the space and the beauty of the area. We did… then you start new somewhere, you collect all you can, so I collected plants and insects and spiders, and you watched birds, I trapped mice and stuffed them for the University of Alaska Museum, and took lots of notes. And of course Olaus and Mardy were there, sometimes they went together, sometimes Bob Krear and I went out, or it was Brina Kessel. So we scattered each day and in the evening we came together and we shared what we had seen. It was a wonderful experience because everybody got along so well. Here's our first camp: you have Mardy, Brina Kessel, who was my mentor at the University, and Bob Krear.

In front of us on the frozen lake, the caribou crossed, and it's wonderful to hear their hooves clicking on the ice, and the only noises are maybe the white-crowned sparrow singing. Even in that silence the passing airplane is a horrible intrusion.

I don't know how many species of insects I collected; many of them haven't been identified. But as the film mentioned, there's three species of mosquitoes, and they're not difficult to collect. I also collected 23 species of spiders. Of course, those figures are wholly incomplete, but it gives you an idea of just the variety of things in the area.

Brina Kessel and I and all the others who helped identified 86 species of birds in the Sheenjek Valley, and again, that's a very minimal figure because we were there only for two months. This is the willow ptarmigan.

There are few grizzlies around; you can talk to Bob Krear on getting closer descriptions. I, unfortunately, didn't have a decent lens with large enough telephoto, so the animals are a little far away.

You know what that is? It's a lynx hiding from me passing by. Like most cats, if you stopped and looked at them, they run away. If you act like you don't see them, they stay crouched, whether you're a lynx or a tiger. So the lynx just stayed and I passed on. But those are the kind of little so-called adventures that are highlights of even a small walk.

Olaus and Mardy are setting off on one of their hikes here. Olaus also made plaster casts of tracks of wolf and bear and other species. He was always active doing something, and this curiosity, enthusiasm, and sense of wonder had a huge impact on me. When I'm out in the field and I say, "Oh hell, I'm going to stay in bed, it's only dawn." I say, "No, I got to get out and do things."

Here Brina Kessel is going into a tall spruce area just to see what birds are there because they're very specific in their habitat.

Here's a mew Gull at the lake. Well it's interesting, at Last Lake there was a pair of mew Gulls when we were there in '56, and there was a pair there in 2006, probably not the same ones. There was an eagle nest on the cliff behind camp in both years, but that could have been the same eagle.

I like having Bob at camp. He not only went fishing but also provided me with fish to measure and weigh. And from that it came out that, for example, a big female like that weighing about a pound has to be about five or six years old before she can breed or does breed.

So you get small insights into the community.

Steve Zack of the Wildlife Conservation Society has worked for years around Prudhoe Bay and at Teshekpuk Lake and so forth, and he gave me four slides to show just some animals that we did not see in 2006. The musk ox is declining in the Arctic Refuge.

Now the Arctic Refuge has international importance…

…Change, and now the reason for monitoring things closely.

Arctic foxes on the North Slope, there are red foxes in the Sheenjek Valley.

We had visitors in camp; this was Supreme Court Justice William O. Douglas, a great wildlife enthusiast. The conservation community needs prominent spokespersons to speak on behalf of the environments. We don't have anybody in this country now that's prominent enough that people listen. And such people can have a tremendous impact like Teddy Roosevelt had when he spoke up. In India it was Indira Gandhi who changed the conservation realm by speaking up strongly on behalf of the environment. Think about it: who shall we select who's already interested that people really listen to of all ages?

We had another visitor in camp, you can see, a ground squirrel, and this is visiting me.

And the variety of plants is huge; this is a pedicularis or louseworte. I just casually collected 138 species of flowering plants during the couple of summer months. I also collected 40 kinds of lichens and

9 kinds of mosses, and if one really worked at it you could double or triple that number.

Just always remember, when you get the propaganda that says the place is desolate and barren and nothing but snow and ice, well, in a few years there won't be any ice, anyway.

Now we get back to what you heard two talks about, the glaciers retreating. This is the one at the head of the Sheenjek, and this is aufeis or river ice, which is also retreating.

So, there will be considerable changes, and of course the climate changes are being well-documented, not just by us: you go to Arctic Village and talk to the people in the Arctic Village and Gwich'in will tell you, "Yes, there's more brush, the caribou don't like that place anymore. The ice is not thick so we cannot go out in the lake as much. The tundra's drier, so it burns. You suddenly see a bird you haven't seen before, like the bluebird." So, these changes are being documented very well by local people. And whenever I go somewhere the first thing I do is get information from the local people, because they've lived their whole lives and they see things that you never will.

We had visitors from Arctic Village, some walked over. This is Peter Tritt; he came over to hunt wolves. At that time the state paid a $50.00 bounty for each wolf. So, we met several of the people and could talk to them about what they knew of the area.

And the caribou define the ecosystem; the travels of the Porcupine herd basically puts limit on that particular ecosystem. And it's also extremely important to the Gwich'in Indians, and less important to the Inuit and Kaktovik because, like the Gwich'in say, "The caribou are not just what we eat, it's who we are." And so you have a double purpose for saving it, not only as a spectacle for visitors, but also for livelihood of local people.

In 1991, we had a get-together at Mardy's home in Moose, Wyoming, and you see Brina Kessel, you see Bob Krear, you see me, my wife Kay who came along; only sadly missing was Olaus, who died in 1963, but he was present in spirit.

Now, let's just look briefly at 2006; this is our 1956 camp at the edge of Last Lake, behind camp is this nice small limestone peak. When I arrived in camp, I climbed that peak just to sit on top. Then, on the next trip in 2006, we climbed it again. And just like Olaus took 2 graduate students or 2 students with him to become familiar with the area and learn to enjoy it, in 2006 we brought 3 students. The 2006 trip was organized by the Murie Center, particularly by Jon Waterman, a writer, who organized everything. If you want to read a good book about the refuge, read "Where Mountains are Nameless," by Jon Waterman. He's made several long trips through the region. And so you have Forrest McCarthy, you have Betsy Young, you have Martin Robards, who is now actually working for the Wildlife Conservation Society. I'm still affiliated with the Wildlife Conservation Society and also with Panthera, which is devoted to the conservation of wildcats.

So we climbed that peak, the same peak again, and this time I knew which one. The only problem was in 1956, when I climbed it, it took me an hour and a half; 50 years later it took me two and a half hours, and obviously I wasn't in very good shape.

Here Martin Robards and I are comparing pictures of our campsite 50 years later, and it's wonderful, some of the same spruce trees are still there. Now Bob Krear and I did increment borings of spruce trees in the area when we were there, and found that it takes them about 100 years to grow 20 feet. So with that slow growth, each tree is valuable; you can't go around casually and cut it down for firewood.

But isn't it lovely to just be in the same place and not see a lot of garbage and everything? Fish and Wildlife Service has very good regulations about taking your garbage out, and if possible, take your feces out as well.

We had a visitor some of you know: Roger Kaye. He came to give advice and help, and his book "Last Great Wilderness" is an extremely good compendium of what happened up to 1960.

Going over to Arctic Village to learn more about what they think about the wildlife and changes and so forth, I was looking around for some of the local people that I knew back 50 years before; they were all dead. But there was one exception: this is Margaret Sam, she came over to our Sheenjek Camp, and thanks to Roger Kaye, we managed to get together again 50 years later and have lunch.

These are caribou crowded on top of a hill, probably to get away from insects and so forth. You always wonder what effect will climate change have on the movements of these animals. The Arctic Slope in the refuge, the Coastal area Gwich'in call the sacred place where life begins. Now that's because the caribou calve there, and they're not going to calve there if there's disturbance. Which means where will they go if you mess up the refuge, the animals go to cross the border into Canada and apparently are very heavily hunted there. So you see these animals scattered, and these beautiful herds, and you wonder what affect the human impact and climate change will have on these great migrations of the Porcupine herd. The number of caribou have decreased over the years: there used to be up to 180,000; now it's calculated there may be only 100,000 left. So, if we want to save a natural spectacle and a resource for the local people, we have to monitor it very carefully.

We always get back to climate change, especially in Alaska and other places where I worked like Tibetan Plateau,

where it is very fast. The fire root is beautiful. The spruce bark beetle has invaded the Tiger Forest in Alaska once it got warmer after the 1970s and killed the trees; then fire swept through the dead trees. Permafrost is sinking, going down. When the permafrost disappears, the lakes and the water disappear, the water in the lakes disappears, and so forth. So, here's a whole very large habitat that is changing drastically and very fast.

University of Alaska established the Toolik Research Station 30 years ago on the Arctic slope, and we visited it. Here they've had a very simple experiment for the last 18 years: they simply put a plastic sheet over a patch of brush that warmed up the brush underneath. And after 18 years, you can see the difference in brush height outside the little covey and inside. That's how fast things can change when the weather changes.

Forrest looking at the pipeline; they did a fairly tidy job of building it, but not a very tidy job of maintaining it. To save money, they don't maintain it very well; this is BP, which is infamous for the Gulf these days, but in a smaller way they've been infamous up there. In 2006, there were two major oil spills where things, cutoff valves and so forth, did not work well. And there are dozens of spills every year. Remember Umiat, the little oil exploration camp? Now you have Prudhoe Bay, which is an industrial city covering about 800 square miles, and it's got about 1100 miles of pipeline, it's got over 500 miles of road, over 25 production facilities plus airstrips and pools where you dump your garbage and so forth. In other words, why go there? You might as well go to New Jersey.

Here's the Coastal Plain of the Arctic Refuge; that's 5% of the total area of the Arctic Slope. Now, can't they show some restraint and not save that 5% and also want to drill there? I honestly can't understand it. It's just greed. You can see the number of leases already in the area. There are some places we're fighting to protect; one is the Colville River, one is Teshekpuk Lake somewhere up in here, where a lot of water birds come to nest. But there's all this area, alright; recent checking of the area by oil companies seem to be that there's less oil there than they thought. Well, I don't care what they think, there's certain places that need to be protected, whether there's a little oil or a lot of oil. And not just for oil; there's coal up there. Are you going to dam rivers, are you going to drill right off shore but need special facilities on land? You can see Halliburton is very concerned about the environment: they planted some trees right here.

The thing is that caribou, adult caribou, they get used to all this noise and facilities, and they'll travel right through like this bull but they will not calve there. They've got to have peace and quiet for calving. So if you disturb their calving grounds, you will push them elsewhere, and if you push them elsewhere, you put them into an area where they will probably have less survival of the young, because they're adapted, they go to the Coastal Plain there for a very good evolutionary reason.

But there's also fun up there, not only being depressed about oil. Here we're rafting down the Canning River, and there's our camp. And it's unusual to meet people, at least that was in 2006; we met one other party up there.

Gary Kofinas, University of Alaska professor, very good at disciplinary work between local peoples and wildlife and environment, he came up to visit and he greeted a bear, or vice versa.

Here are the big Coastal Plains. You must admit, sure, it's flat, but even because of that, if you have one building or one tower, you lose the whole wilderness aspect. You ruin the peace, just as in the Grand Canyon the peace was ruined by endless numbers of planes flying up and down bringing tourists. So, you really need to protect an area and manage tourism and any development very strictly.

And the caribou need the place, the ground squirrels need the place, the (unclear) need the place.

And here we're heading toward the ocean. It was a marvelous trip, a very congenial group, everybody interested.

And remember the polar bears are now considered an endangered species, and they den on the land, their ice is retreating, they have a hard time ahead.

We should always realize that conservation is a moral issue of beauty, of ethics, of spiritual values, the precious intangible values that Olaus Murie talked about. So, the ultimate test of a moral society is the kind of world it leaves to its children. Thank you.

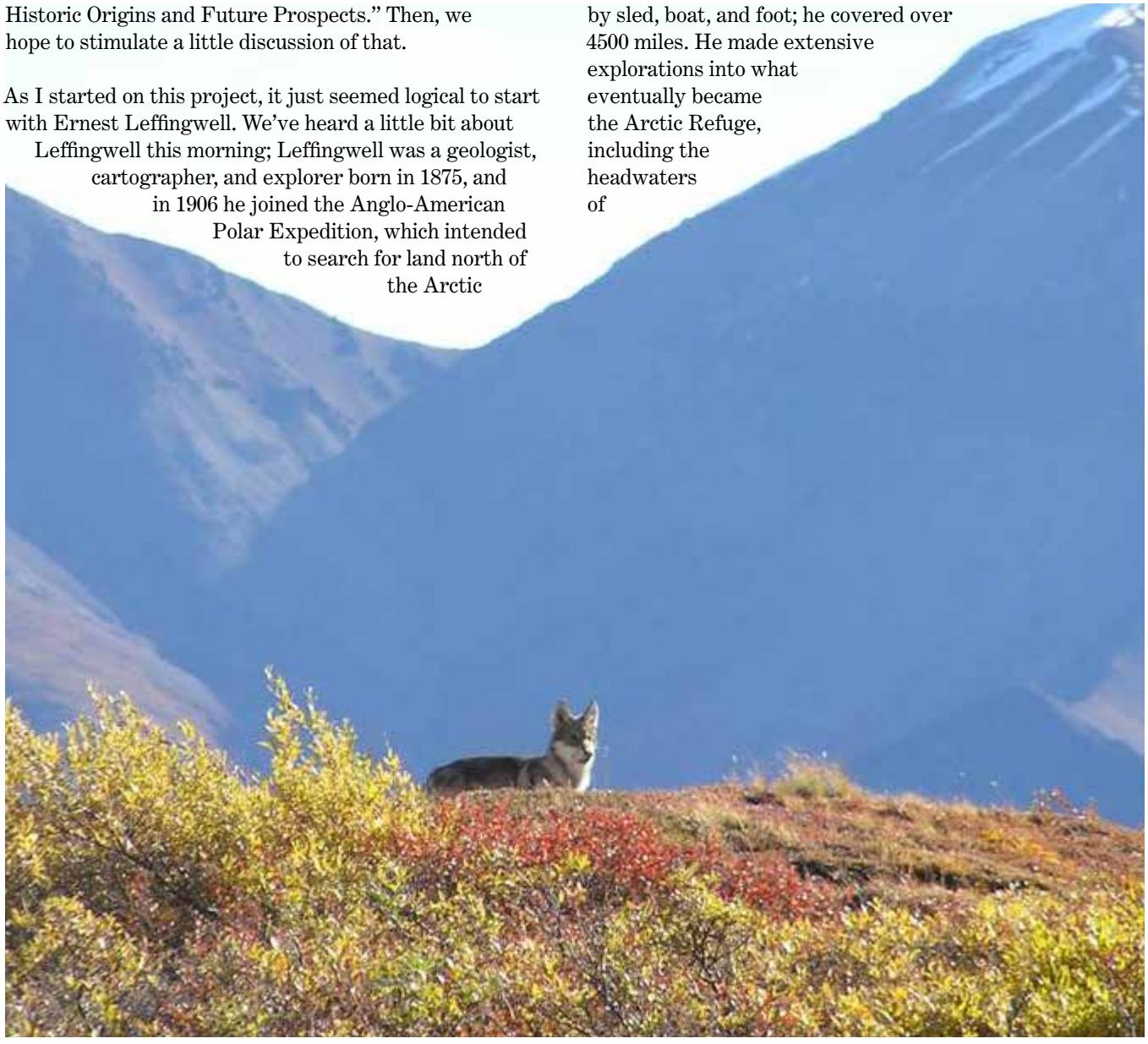
Fran Mauer and Dr. David Payer: "The Arctic Refuge as a Scientific Control: Historic Origins and Future Prospects"

Dr. Dave Payer: It's incredibly humbling for me to follow George Schaller. Twenty years ago, when I was a graduate student studying mountain sheep, I wore out my copy of "Stones of Silence;" it taught me very much the power of patient observation, and I've tried to carry that through my career, and I thank you very much for that, Dr. Schaller.

So, with that I'm to cover a brief history, a brief overlook at scientific research on the Arctic Refuge as kind of a lead-in to what Fran will be discussing, the value of "The Refuge as Scientific Control: Historic Origins and Future Prospects." Then, we hope to stimulate a little discussion of that.

As I started on this project, it just seemed logical to start with Ernest Leffingwell. We've heard a little bit about Leffingwell this morning; Leffingwell was a geologist, cartographer, and explorer born in 1875, and in 1906 he joined the Anglo-American Polar Expedition, which intended to search for land north of the Arctic coast of Alaska. The expedition reached Flaxman Island, northwest of the Canning River, the current Arctic Refuge, before it was stopped by ice. Their schooner the *Duchess of Bedford* was locked in the ice and damaged, and was dismantled to build these crude shacks out on Flaxman Island. Most of the expedition, it must have been just a horrible winter for them, most of them left the following summer, but Leffingwell stayed on, and, in all, he spent nine summers and six winters in the cabin on Flaxman.

He made over 30 exploratory trips into the area by sled, boat, and foot; he covered over 4500 miles. He made extensive explorations into what eventually became the Arctic Refuge, including the headwaters of



Brad Meiklejohn

Wolf in Arctic NWR.

the Aichilik, Hulahula, and Canning Rivers, and we saw some of the results of his work today during Matt's talk, and Forrest's as well. He made friends with the local Inupiat people and adopted their practices. Here he is along the Canning River with Inupiat hunting camp, and you can see that, even then, there were quite large shrubs on the arctic coast or the arctic foothills.

He had little funding and he relied on loans and grants from friends and family. He even tried his hand at whaling to raise funds for the expedition, but he was unsuccessful in that. His 1919 report, *The Canning River Region, Northern Alaska*, was published the U.S. Geological Survey; it's an encyclopedic treatise on the geology of the region. But he was really a renaissance man; it also included natural history observations, astronomic observations, anthropology, detailed maps of the area, history of exploration before his time, and accounts of logistics while working, traveling, and living in the Arctic. It's really a fascinating read. He died in 1971; there're still remnants of his camp on Flaxman Island. And in 2005 I found one of his photo points, these cairns along the Canning River, and this is the same cairn that Forrest visited in 2006. It really was one of the highpoints for me to date in my career with the Arctic Refuge.

We've heard quite a bit about the Muries' Sheenjek Expedition, and you know the purpose of the expedition was to document the aesthetic and ecological values of the area, reasoning that such an effort would demonstrate the area's value to science and enhance public support. Obviously, Olaus and his coworkers were highly skilled ecologists and naturalists, and we've seen over and over again during this symposium evidence of the enthusiasm with which they approached their work that summer. It really must have been an amazing thing to be part of that expedition, and it obviously continues to inspire us greatly.

The reports and publications from the expedition are filled with interesting and carefully documented ecological details, but just as importantly, I think, they conveyed the wonder that these researchers felt in the presence of such a wild, living landscape. Several of the accounts of the expedition continue to inform and inspire people to this day, and we certainly refer to them often.

"Birds of the Upper Sheenjek Valley, Northeastern Alaska," by Drs. Kessel and Schaller, published by the University of Alaska in 1960; writings from the Muries, including Mardy Murie's wonderful "Two in the Far North;" William O. Douglas's "Brooks Range" and "My Wilderness: The Pacific West;" Dr. Schaller's report "Arctic Valley," which is a wonderful report and includes this beautiful introduction that I read over and over again; and Dr. Krear's 2006 publication, "Four Seasons North," are enduring testaments to the scientific value of the area, but also speak to the personal transformations that are possible when one immerses oneself in such a magnificent place as this.

This is a picture of the Nyrupuk Lakes; this is Peters Lake, or Lake Peters, in the foothills of the Brooks Range. These lakes are unique in being deep, glacially-formed lakes in the northern foothills of the Brooks. The area is obviously highly scenic, and it's important to local people, and has been so for a long time, for subsistence, hunting, and fishing. Ernest Leffingwell reached Lake Peters in 1911, and conducted a reconnaissance of the area's geology.

The U.S. Geological Survey, with support from the U.S. Navy Office of Petroleum Reserves, established a tent camp in the area in 1952. Then, in 1958, during the International Geophysical Year, a party of geologists led by G. William Holmes reached the area and established a more permanent research station; you can see in one of John Hobbie's pictures, here, the research station in 1959. Holmes obtained support for this from the Cambridge Research Center of the U.S. Air Force. I found out he initially planned to conduct studies on Ellesmere Island, in the eastern Canadian high Arctic, as part of the International Geophysical Year, but that proved too logistically difficult, so Lake Peters was selected as an alternate site. After a few years, management of the station was taken over by the Office of Naval Research Arctic Research Laboratory, and the site became a satellite station for the main naval arctic research lab facility in Barrow, Alaska. By 1964, this Lake Peters Station was one of 21 satellite stations in northern Alaska conducting a variety of research, primarily geophysical.

Dr. Hobbie's work in the late '50s and early '60s, which he'll be talking about this afternoon, and I very much look forward to that, on the physical limnology of Lakes Peters and Schrader was really groundbreaking. Dr Hobbie spent a couple of winters out there as well, which hadn't been done up until that point.

Other work during the '60s included geologic mapping, glaciology, and archeology. There was an increasing focus on biological studies, including fisheries, wildlife, and botany during that time. And the U.S. Fish and Wildlife Service used the site intermittently as a base for the surveys of large mammals. Beginning in 1968, U.S.G.S. launched a major effort, based at Lake Peters, to map the Arctic Range, which had been established eight years previously. During this period, there were also research camps located elsewhere on the range at Jago Lake, Ayakulik Lake, and, as Matt Nolan described, on McCall Glacier. By 1970, the site consisted of several buildings, and when William Holmes, the man that had the original vision for the station, died in 1970, it was named in his honor, and this is a picture of the plaque that's on the building there.

In the early 1980s, the Naval Arctic Research Lab was closed and the Holmes Research Station was transferred to the U.S. Fish and Wildlife Service. Several outbuildings were removed, and the site was cleaned up and rehabilitated; this is a recent picture of the site. Use of the facility by researchers and for hosting

visiting dignitaries continues to this day. And in this photo, taken from the south end of the lake, looking north, you can see the Shublik Mountains, and the station is here, on the tip of an alluvial fan, you can just see.

Much of what we know about the Arctic Refuge has resulted from work that's been obtained as a result of the threat of industrial development from some planned project. The projects haven't come to pass, but we still have the record of the information that was collected. The Arctic Gas Studies occurred during 1972 through 1977, and in the early '70s there was a proposal to build a natural gas pipeline in Prudhoe Bay, across the Arctic Range and adjacent areas that eventually became the Arctic Refuge, to the Mackenzie River Valley and northwestern Canada. The pipeline would tie into planned infrastructure there and transport gas to Manitoba. Two routes were considered, shown in this slide, one crossing the range to the north, the other to the south. A Canadian-based consulting firm initiated studies to inventory natural resources along the proposed pipeline routes and evaluate potential development impacts. In the United States, the Bureau of Sport Fisheries and Wildlife and the U.S. Fish and Wildlife Service joined the Alaska Department of Fish and Game and the Bureau of Land Management in contributing to these studies. Although there had been several site and species-specific studies of fish, wildlife, and plants conducted in the preceding decades, the overall distribution, abundance, and habitat associations of species inhabiting the area was really relatively poorly known up until this time.

Dr. Patricia Reynolds, currently an ecologist at the Arctic Refuge and with us this week, worked on these studies in 1973 and 1974. Patricia assisted with large mammal research, including studies of sheep, bears, and musk oxen. One summer was spent working out of a tent camp on the Marsh Fork of the Canning River; her team conducted experimental studies there on the effects of noise on sheep using a mineral lick.

The Arctic Gas Studies resulted in a 40-volume series of reports, plus supplements. The reports documented a wide range of topics, including distribution and abundance of Porcupine caribou, distribution and abundance of large mammals, furbearers, and birds, characteristics of rivers and fisheries, vegetation and wildlife habitats, and effects of industrial activities. Plans to establish a gas pipeline across northern Alaska were abandoned in the late 1970s, but the reports still stand as a wealth of information about the resources of the region at that time.

I interviewed Mike Spindler, who was hired by manager Ave Thayer to be the Arctic Range's first permanent biologist in 1978. Mike was a recent graduate of the University of Alaska at Fairbanks, and he earned his master's degree under Dr. Brina Kessel. Prior to his arrival, most of the refuge's biological work was conducted by cooperators and facilitated by refuge staff. Mike's first task was to complete required reports, and these were monthly reports enumerating the number of birds and mammals on the entire range by species. This must have been a daunting task for one person in an area over 8 million acres in size; I think they kind of winged it, from what I understand.

But he speaks with great fondness of the first years of his appointment at the Arctic Range. He was given a lot of freedom by Ave and the assistant manager, Don Ross. He was inspired by the approach of the Murie Expedition in the Sheenjek Valley, having worked with Brina Kessel at the University, and he emulated that by establishing field camps where he and a small crew would stay from late spring through fall to document the flora and fauna of the area. He conducted studies on the Aichilik River Delta on the Arctic Coast in 1978, at the Firth-Mancha Research Natural Area near the northern treeline in 1979, and in the Brooks Range along the Hulahula River in 1980. Mike's reports have been used by us as a baseline for documenting long-term changes in refuge ecosystems.

As I talked to Mike, I got the sense of something that I already knew to be true: that the refuge's biological program changed dramatically with the passage of the Alaska Lands Act in 1980. Mike became part of a much larger team conducting studies of bird populations on the refuge's Coastal Plain. He left in 1984 to pursue a career in management on several other Alaska refuges; he's currently a manager on Kanuti Refuge in interior Alaska.

So, the Lands Act was a significant piece of legislation for the Arctic Refuge on a number of fronts; the refuge more than doubled in size, and additional purposes were added, including conserving fish and wildlife populations and habitats in their natural diversity. Section 1002 of ANILCA authorized petroleum exploration on the Coastal Plain during the winters of 1984 and '85. It also called for an inventory and assessment of fish and wildlife resources and analysis of potential impacts of oil and gas development on those natural resources of the area, and on subsistence opportunities. This was an ambitious campaign, resulting in significant and lasting changes to the refuge's biological program. Initially, there was some question about who would run the studies; the U.S. Geological Survey was considered, Fish and Wildlife Service Research Branch - at that time the Fish and Wildlife Service had a specific research branch—and the refuge was considered as well. The refuge won, if you will.

Supervisory biologist Dr. Gerald Garner was hired, followed by several biologists, including Fran Mauer and Patricia Reynolds, who went on to spend the majority of their careers on the Arctic Refuge. There were also armies of seasonal technicians spreading out across the Coastal Plain. Fish and Wildlife Research Division did have a significant role, particularly in caribou studies, in which the first satellite collars were deployed on that species. Biologists worked on field projects in the summer, and observers on seismic trains in the winter, as Glenn Elison mentioned before. Massive reports were produced

on short deadlines, and we have shelves of those reports. Intensive fieldwork was conducted during 1982 through '85, and a final report published in 1986. This was followed up by a Legislative Environmental Impact Statement in 1987, which was partially based on that biological information.

And that legislative EIS noted that development would have significant effects on several species of wildlife, including, in particular, caribou of the Porcupine herd and musk oxen. The EIS also noted that development would eliminate the wilderness value of the Coastal Plain, limit subsistence opportunities and, importantly for the context of this discussion, would reduce the value of the areas as a pristine natural laboratory.

The geological studies looked promising, however, and the Department of Interior at that time, citing a need for more domestic energy production, selected full leasing of the area as their preferred alternative. As we know, however, legislation to open the area to further exploration and development was never enacted.

Many of the monitoring and research programs initiated during the baseline studies continued for a decade or more, although at a reduced level of funding and staffing. The Fish and Wildlife Research Branch, which was primarily involved in caribou studies, moved over to USGS to become the Biological Resources Division, or Discipline. The continuing baseline studies were summarized in a 2002 report, co-edited by U.S. Geological Survey and the Fish and Wildlife Service. Because of continued political and public interest in the refuge's Coastal Plain, the rest of the refuge received far less emphasis from a biological perspective. And even now, large regions, particularly in the Boreal forest and the southeastern portion of the refuge, are relatively poorly known.

The vision of the founders and the original purpose of the refuge—to preserve wildlife and wilderness values—really was prescient. The Alaska Lands Act's mandate to conserve fish, wildlife, and their habitats in their natural diversity, and the National Wildlife Refuge System Improvement Act of 1997, with its mandate to maintain biological integrity, diversity, and environmental health on all refuge lands, represent, I think, an evolution of ecological consciousness in public lands management. Recently, there's also been reaffirmation by our leadership of the central role of science within the Fish and Wildlife Service and the Refuge System. These factors, plus the special status of the Arctic Refuge as the crown jewel of the refuge system, and the challenges faced by land managers in a year of rapid climate change that's really exacerbated at high latitudes, as we've heard, have shaped the current biological program on the refuge.

At the refuge level, our focus has broadened to include both single species management and long-term ecological monitoring. We continue to monitor the distribution, abundance, and demographic indices for a number of species, such as caribou, musk oxen, moose, dall sheep, peregrine falcons, golden eagles, and others. We've worked closely with partners in academia, government, industry, and non-governmental organizations to evaluate factors affecting nesting success with tundra nesting birds. And we've expanded that focus recently, in collaboration with Dr. Stephen Brown of Manomet Center for Conservation Science and others, to include evaluation of vital post-breeding coastal habitats used by these shorebirds prior to migration.

We've had several undergraduate, masters, and PhD students working on the refuge in recent years; three of them are shown here, and those three are here with us this week. The guy on the lower right is our stalwart ornithologist, enjoying a summer cruise on the Beaufort Sea. We anticipate new collaborations with universities that will provide opportunities for more natural resource students.

And I think our staff has really done an outstanding job in developing scientific partnerships and maintaining a high level of scientific rigor, as evidenced by an impressive and growing list of publications in recent years. We're particularly fortunate that a number of researchers with expertise in physical processes, such as glaciology, hydrology, and climatology, have chosen to work on the refuge.

The work of Matt Nolan, as you heard earlier, and his family, and their predecessors on McCall Glacier is providing invaluable insights into glacial processes and how changes to those systems may affect aquatic systems downstream, including the fish and wildlife that rely on them. And this is an area that we're attempting to develop further right now. He's demonstrated dramatically, by glacial melting, loss of sea ice, and coastal erosion, rapid changes are occurring in arctic climate. These changes are likely causing cascading affects in ecosystems that are poorly understood, and predictions of future changes carry much uncertainty, in part because of the inherent high variability in arctic climate and ecosystem responses. This underscores the need for carefully designed long-term monitoring efforts.

During the mid '90s, we established a network of five long-term ecological monitoring sites, and we show those sites in the upper left figure here; the sites are located in each of the five major eco-zones within the refuge. Parameters that are monitored at these sites include climate, vegetation structure, vegetation composition and succession, permafrost thaw, and additional studies document bird populations, small mammals, and invertebrate communities. We visit these sites on a rotating basis every five years.

We're also doing work matching historical aerial photographs with current satellite imagery to document changes occurring here; these studies will contribute greatly to our knowledge of the refuge's biological baseline and how that's changing over time.

We joined several international monitoring networks as well, including the Arctic Coastal Dynamics Network, which is a multinational, multidisciplinary program that seeks to document, understand, and predict changes occurring in this vital Arctic Coastal Zone as a result of climate change and changes in sea ice. As we've heard, sea ice is receding, and that's led to a variety of changes in these vital biological habitats.

We have a key monitoring site at Beaufort Lagoon, shown here in the bottom right, where we measure erosion, accretion, and ground-ice characteristics along the coast. We've worked with Kaktovik residents to describe changes occurring on Barter Island and on nearby coastlines.

We're part of the Global Observation Research Initiative and Alpine Environments, which is an international network of vegetation and climate observation sites on mountaintops.

The high latitude and varied topography of the Arctic Refuge make it an excellent place to study and evaluate climate change effects, such as changes in vegetation and the northern treeline and altered hydrological regimes.

We're actively involved in the Arctic Landscape Conservation Cooperative, which seeks to develop partnerships to evaluate effects of climate change and other stressors on arctic ecosystems, and to guide adaptive, landscape-scale conservation with management.

As I reflect on all of this, I'm reminded that the notions of a fixed biological baseline and this idea of managing for historic conditions are really being challenged by rapid climate change and rapid land-use changes in the North. So, I think the importance and value of the refuge as an undisturbed scientific benchmark for understanding effects of climate change and effects of human activities, both close by and distant, as we saw with the soot accumulation on the glaciers, has never been greater.

So, I'll now turn it over to Fran to discuss the historic origins and future prospects of the refuge as a scientific control.

Fran Mauer: Nearly sixty years ago, conservationists embarked on a historic campaign that led to the establishment of the Arctic National Wildlife Range in 1960. Part of the urgency in the campaign was the rapid construction of military facilities across Arctic North America for the Distant Early Warning System, which included a chain of radar installations extending from Alaska to Greenland. Conservationists were alarmed by the prospect that the essentially undisturbed Arctic would be irreversibly changed, and they concluded that action was imperative to save at least a part of the Arctic in its original condition. As we have heard from Roger Kaye and others, the post-war era also brought the realization that the natural world was under siege like never before, and it was time to act to save some of it before all wildness was lost. And so, the campaign to establish the Refuge began.

We have also heard already how it was Aldo Leopold's writing that wild places should be preserved as "a base datum of normality" which likely stimulated the thinking of the refuge's founders, who soon began to talk about the scientific control concept. In an early report of their survey, Collins and Sumner stated that "it could be used as a control for comparison with other areas." In Northeastern Alaska, conservationists found an essentially undisturbed ecosystem which they believed should be protected so that all the species and the natural ecological processes could persist. This aspect of a "control area" was expressed very early in the campaign by Collins and Sumner: "Every species would be left to carry on its struggle for existence unaided." Later, as the campaign had developed, this idea was reinforced by others, such as University of Alaska professor William O. Pruitt saying that "the greatest value of the Range is as a control area." He also predicted that "the Arctic National Wildlife Range will play an extremely important role in the wise use of the Arctic."

In other words, they felt the area should not be disturbed or manipulated. Olaus Murie, reflecting on the newly established Range in 1961, described his view:

…the Arctic Wildlife Range …Should not be radically changed as a wildlife management experiment… it should be kept for basic scientific and for observation as to help us for our understanding of the natural processes of the universe.

From this statement, it is obvious that Murie was thinking big ideas for the long time frame. The value of protecting evolutionary processes in at least a few parts of the earth was an idea he had held for some time. His 1954 Journal of Wildlife Management article, entitled "Ethics in Wildlife Management," ended with the statement "Evolution is our employer." In the Arctic National Wildlife Range, Murie saw a place where evolutionary processes and wildlife diversity were still intact, and it was one of the best places left in the world for such preservation. He also felt that it should be a place where nature is free of human intention and intervention. When we gathered in Fairbanks in 1985 to mark the 25th anniversary of the Refuge, Lowell Sumner sent a message in which he very eloquently restated the founders' intention that the Refuge remain "free from meddling human concerts and the urge to take possession of and use up what we so imperfectly understand."

We all are familiar with Thoreau's "In wildness is the preservation of the World." But what is wildness? Wildness is where nature is self-ruled or autonomous. It is where nature is independent of human control, lacks intentional manipulation or intervention by humans. Wildness is where humans have chosen to let nature be as it is. The advantages of maintaining the Refuge as a scientific control or repository of wildness are several. In a recent paper ("A Hands-Off Approach to Preserving Wildness in Protected Areas"), Peter Landres outlined what some of these advantages might be:

- Strengthens our respect for nature's autonomy
- Encourages scientific humility
- Allows for evolutionary change
- Protection for non-focal species
- Provides unmanipulated benchmarks
- Preserves options and hedges risks

Such advantages are precisely what Collins, Sumner, and Murie had in mind for the Arctic Refuge.

Prospects for the Future

Let us now consider the future. Today, we find the Refuge in the midst of global climate change, which poses a number of significant challenges. We are at a crossroads of parallel importance to the post-war era, when the Arctic Refuge was born. This is again a time of profound changes and uncertainty. In considering the Arctic Refuge as a scientific control or repository of wildness, it is important to realize that, while nature in any area may no longer be free of the effects of climate change, the Refuge can still remain wild if it is not intentionally manipulated. Fortunately, in the case of the Arctic Refuge, there are several assets that play in favor of retaining its wildness and avoiding human interventions. Some of these assets include its large size, remoteness, and adjacent network of protected areas; the Refuge clearly occupies the wild end of the spectrum in this network. Its diversity of landscapes, species, and intact ecological systems and processes all foster ecological resiliency. Institutional assets, such as legal protected status (National Wildlife Refuge and Wilderness designation), significant existing baseline data, participation in landscape-scale networks, and strong public support, are also advantages which will enable appropriate stewardship of the refuge as a repository of wildness.

What can we do to help without engaging in heavy-handed intervention? Stewardship decisions to lessen the effects of climate change on the refuge's ecological systems might include careful management of recreational use, re-examination of the effects of human harvest on key wildlife species, methods aimed to prevent the introduction of invasive species, and the use of non-intrusive research and monitoring methods. Examples might include advanced remote sensing and DNA identification of individual study animals instead of telemetry. If marine transportation along the outer coast of the Refuge increases, as is predicted, due to opening of the fabled Northwest Passage, there will need to be proactive measures to protect and prevent impacts such as fuel spills and increased tourism from cruise vessels. Obviously, it is imperative that the Refuge continue to be protected from all forms of industrial activity, such as oil and gas exploration and development.

Given the uncertain nature of changes associated with a warmer planet, there will undoubtedly be challenges to keeping the refuge free of human interventions. Already, there seems to be a rush by some to invade the quiet of the wilderness with helicopters to scatter weather recording stations so that "adequate data" will be available to make "management decisions." Olaus Murie used to recommend what he termed the "go easy method" and think ahead before getting into situations where the end justifies the means. We could use the "go easy method" now because there is much uncertainty; it is easy to make miscalculations, but it is not easy to undo such errors in a wild place.

Another issue is intervention. Will we intervene on the autonomy of nature in the Arctic Refuge if we fear that a species of human interest is in trouble, or is perceived to be in trouble? Such situations will be extremely difficult to address in a thoughtful manner. A good scientist would never tamper with the control. Perhaps by leaving things alone in the Arctic Refuge, we will be able to learn something that we could never learn once we have intervened in its ecological and evolutionary processes.

Conclusions

In summary, while the original concept of the Arctic Refuge as a scientific control has only been applied in limited ways, its potential remains intact, and may prove to be of great value as we face the coming challenges of global warming and other influences. Today, we are again at a pivotal moment in the history of our species and our relationship to the natural world. As we seek the best science for guidance in making societal decisions, we must be cautious not to disrupt the integrity of our control in the name of science. As we joyfully celebrate the 50th anniversary of the Arctic Refuge, a priceless gift of the founders for the whole world, I encourage all who are involved in its future as a repository of wildness, to take heart in the words of those wonderful people. Let us strive to keep the Arctic Refuge wild—as Margaret Murie stated, "empty of technology and full of life," so that, in fifty years, a hundred years, and a thousand years from now, the refuge remains as her husband Olaus described it: "a little portion of our planet left alone."

Pamela Miller: "Ecological Values of the Arctic Refuge in a Changing World"

Brad Meiklejohn

Pack Rafts in Arctic NWR.

Introduction

From the theme of this symposium, *The First Fifty*, I will turn to the next 50 years of the Arctic National Wildlife Refuge. How can we ensure that its ecological values at a landscape scale remain intact and that our national commitment to its wilderness purpose—so visionary at its founding—lives on?

To illustrate this path forward, I will tell a few stories from my life. I have a rather twisted trail that keeps bringing me back to the Arctic Refuge, a different path from others at this Symposium. While I began my career in the U.S. Fish and Wildlife Service, first counting arctic birds on their wintering grounds along Puget Sound, then joining the staff of the Arctic Refuge as a bird biologist in 1982, I have worn many other hats since then to protect the refuge.

My talk is going to look back at some of the last 50-years of Arctic Refuge history that I don't want forgotten. Yesterday, former Refuge Manager Glenn Elison referred to a little bit of it from his watch during the 1980's.

I also want to look at how we continue to have this landscape scale wilderness, for the next 50 years, for 500 years, as Assistant Secretary Tom Strickland so wonderfully challenged us to think about last summer at the 50th Anniversary kickoff celebration in Alaska. How do we dream of 500 years in the future? We can look back 400 years since Columbus and see how colonization changed our nation and its lands so dramatically. Looking out 500 years more, if we are to breathe hope into the idea of still having wild, intact ecosystems on earth like the Arctic Refuge it depends on our community of life.

The most important lesson that Mardy Murie taught me is that wilderness is where we as humans came from, where we have lived most of our existence on earth. In his book "Maps and Dreams" about the Athabascans, Canadian Hugh Brody wrote that hunter and gatherer societies have "unparalleled historical depth."[1] They are the most expert of the peoples in the world because they've been doing it the longest. "In the North, thanks to great herds of buffalo or caribou…hunters continue to practice their systems following ancient, though never static, patterns," noted Brody. The people survived, they thrived, in these remarkable places. It is a way of being that continues today.

Bringing homeland into the discussion of landscape-scale protection is fundamental to what I have gained from Mardy Murie about wilderness and its value not only to the refuge itself but also to the planet. The idea that wilderness means separateness of people from the land is an obstacle that ignores the foundation of our long relationship with the land, as Murie talked about in "Two in the Far North:" "wilderness itself, the basis of all our life, does it have a right to live on?" [2]

Community is essential to ensure this interconnected web of all life endures in the Refuge and on the earth as we face the changing climate. People living both near and far from the refuge who value the land as it is—"as the Creator made it," like Gwich'in leader Sarah James spoke earlier—must connect together if we are to sustain this intact landscape and its full community of life.

As I tell a few stories of my life, I will weave this in. I also want to start with how I was going to end, to make sure I have time for it.

Celia Hunter gave a very different speech at the Arctic Refuge's 25th anniversary symposium than you might expect from one of Alaska's major conservation movement founders.[3] She talked about what we need to do to protect the Arctic National Wildlife Refuge into the future:

"*To undertake this kind of campaign…people must care for each other. Each person must care for himself or herself. To do this means focusing on human beings, and how they tick. Mardy touched on one aspect of this human need when she reminded us that we, the environmental community, need to remember how to celebrate…We must remember that in her vocabulary, that including dancing.*"

I have taken that very much to heart this year, especially the dancing. She went on to say,

"*So much of what goes on in the world, which is reported by our…media is in reality the stormy surface of the ocean. Below in the depths, life proceeds undisturbed by all that… When we put ourselves in touch with these eternal and irresistible forces, which truly govern our planet, and indeed our whole universe, we quiet our souls. We quiet our minds and our beings. And we find that perspective in the world around us, which enables us to move and act in those places where we can be effective, and can permit others to care for the things beyond our reach.*"

A Young Field Biologist Gains Roots in the Fairbanks Community

I first saw the Arctic National Wildlife Refuge in 1982. I worked as a wildlife biologist for the U.S. Fish & Wildlife Service on the Coastal Plain Resource Assessment biological baseline study program.[4]

Yet I first learned about the Arctic when I was 3 years old. Late in his life, my dad unearthed flash cards of North American mammals he had read so long ago: collared lemming, tundra vole, muskox, polar bear, beluga. The caribou card said, "shy but curious, found in great herds, migrates, feet click at each step," and described how the Native people depended on the caribou. This learning about Arctic animals from a loving parent shows me how important a seemingly small thing is to a child.

In the community of Fairbanks I was blessed, by chance meeting Romany Wood at a contra dance and renting her cabin. It turned out she was conservationist Ginny Hill Wood's daughter, and that my new next-door neighbors would be Ginny Wood and Celia Hunter. I spend my last years with the U.S. Fish & Wildlife Service at that wonderful place and again today live in the same neighborhood.

It was the actual cabin where the Alaska Conservation Society—Alaska's first homegrown environmental organization—was born. They had a mimeograph machine in the same room where I had my first PC home computer, and they cranked out information and spread the word about the issues of that time: to establish the Arctic Wildlife Range, to protect declining polar bears from aerial sport hunting, to halt Project Chariot's nuclear blast being detonated in the Point Hope Inupiaq hunting grounds and homeland, to stop Rampart dam from flooding most Gwich'in villages and the area now the Yukon Flats National Wildlife Refuge.

I got to meet Mardy Murie and other people who were important to me not only as conservation champions but also as mentors. This cycle continues here at this Symposium today.

1 Hugh Brody. 1981. Maps and Dreams. Patheon Books: New York. P.29.

2 Margaret E. Murie. 1997. Two in the Far North, 35th Anniversary Ed., 5th Ed. Alaska Northwest Books, Portland, p. 359.

3 Celia Hunter. December 8, 1985. "Wrap-Up" speech on Alaska's Wilderness Heritage at the Alaska Environmental Assembly Annual Conference "Wilderness and People;" Commemoration of the 25th Anniversary of the Establishment of the Arctic National Wildlife Refuge, Fairbanks, Alaska. Transcript: http://digitalmedia.fws.gov/cgi-bin/showfile.exe?CISOROOT=/natdiglib&CISOPTR=9329&filename=9330.pdf#search=%22celia hunter%22.

4 Alaska National Interest Lands Conservation Act, Sec. 1002 (c); 16 USC 3142.

I was lucky enough to attend the 25th anniversary of the Arctic Refuge symposium in Fairbanks organized by Alaskan conservationists. As an idealistic wildlife biologist, I was inspired by Mardy Murie's keynote speech at the University of Alaska Fairbanks where she had been the first woman graduate in 1924. She hoped those listening might remember these 10 words from her speech: "through our history, good things have been accomplished by a few." [5]

At the time, I did not fully appreciate this milestone in conservation, but I was thrilled to meet the author of "Two in the Far North." This began my awareness of how much the practice of field biology for our tundra bird habitat studies in the Arctic Refuge was grounded in the tradition of Olaus Murie and other great field naturalists: extensive ground-based field study, nightly field journal writing, and keeping detailed records on weather, plant phenology, and plant diversity in addition to the bird records.

I recently realized I wrote one letter to President Jimmy Carter about the Alaska Lands Act, urging Wilderness protection for the Arctic Refuge and for him to do everything to make that happen. Just back from my first trip to Alaska, I wrote in November 1978,

"*I was faced by the stark reality of how quickly the character of Alaska land is changing due to pressure of profit-minded development. It is important to protect the wildlife and their habitats in Alaska through preservation of whole ecosystems…These beautiful and ecologically important lands in Alaska must be preserved for all Americans, for the future.*"

By going to a slide show in Olympia, Washington, where I lived at the time, I connected up with the Alaska Coalition organized to pass this landmark conservation law. Without knowing it at the time, a simple evening discussion about Alaska linked me to my current Fairbanks neighbors and colleagues—and ultimately to hearing President Carter with you at this symposium.

My letter was just one of millions in the vital grassroots effort essential to establishing the world-class conservation system through the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). Across the sweep of Alaska, its mosaic of conservation areas today includes 13 national parks, 16 national wildlife refuges, two national forests, 26 wild and scenic rivers, recreation and conservation areas, and 56 million acres of designated wilderness across Alaska. The Alaska Lands Act set out a visionary framework for conservation that built on the underlying premise when the Arctic Refuge was established:

"*To preserve in their natural state unaltered arctic tundra, boreal forest…to preserve unrivaled scenic… values associated with natural landscapes…to provide for... those species dependent on vast relatively undeveloped areas; to protect the resources related to subsistence needs; to preserve wilderness resource values… within large arctic and subarctic wildlands and on freeflowing rivers; and to maintain opportunities for scientific research and undisturbed ecosystems.*" [6]

In August, 2011, it was remarkable to see Ginny Wood be awarded the U.S. Fish & Wildlife Service's Citizen Award for all her work, starting with her grassroots organizing that helped convince the Eisenhower Administration to set aside what has become the Arctic National Wildlife Refuge today.[7] In the very cabin where she had done much of this conservation work, Rowan Gould, Acting Director of the Fish and Wildlife Service presented the award saying, "Ginny you were so far ahead of your time with the vision of protected, large landscapes." Noting how he had just returned from the scene of BP's Deepwater Horizon oil spill in the Gulf of Mexico, Gould continued, "Here in Alaska the land will stay sculpted by nature, not human hands. We still have things to work with at the landscape scale."

We do a lot of things in the conservation community in our education and advocacy work. One thing we don't do enough—with the agencies, with our friends and champions, and the people who are in the trenches day to day—is to thank them. The Northern Alaska Environmental Center took the occasion of the Citizen Award to thank Ginny Hill Wood as a visionary.[8] In a full-page ad in the Fairbanks paper, we shared some quotes from her moving Congressional testimony on the proposed Arctic Wildlife Range:

"*The aesthetic, spiritual, recreation, and educational values such an area are those one cannot put a price tag on any more than one can on a sunset, a piece of poetry, a symphony, or a friendship.*" [9]

5 Dermot Cole, December 8, 1985, "Murie cites need for saving wild places," Fairbanks Daily News-Miner, p. A-7.

6 ANILCA, Sec. 101, Purposes; 16 USC 3101.

7 U.S. Department of the Interior. Service Citizen Award to Virginia Hill Wood. August 12, 201. Signed by Rowan Gould, Acting Director of U.S. Fish & Wildlife Service (award ceremony was August 11, 2011).

8 Fairbanks Daily News-Miner. August 13, 2010. "Thank You, Ginny Hill Wood for your vision of Arctic Wilderness and Happy 50th Birthday, Arctic National Wildlife Refuge." Full page ad sponsored by Northern Alaska Environmental Center, Gwich'in Steering Committee, Arctic Audubon Society, Alaska Conservation Foundation, The Wilderness Society, Alaska Center for the Environment, Friends of Alaska National Wildlife Refuge, Alaska Wilderness League, Sierra Club, Alaska Chapter.

9 Virginia Hill Wood, Oral Statement at Fairbanks Field Hearing on October 31, 1959, at p. 336; pp. 335-339
In: U.S. Senate, Arctic Wildlife Range—Alaska, Hearings before the Merchant Marine & Fisheries Subcommittee of the Committee on Interstate and Foreign Commerce, 86th Congress, On S. 1899, A bill to authorize the establishment of the Arctic Wildlife Range, Alaska, and for other Purposes. Part 2.

But you know, when she showed up at that hearing in 1959, to testify before Senator Bob Bartlett (D-AK), who was gracious but a stalwart opponent, Ginny did not feel like she was a visionary; she was just showing up. She kept showing up, she kept showing up again, she did her homework, she did her writing, she talked to her friends. She found ways to talk to more friends at Camp Denali. She ended up being a force that has forever shaped Alaska to be the wild place it is today, for it to still be the real Alaska. We have heard some at this Symposium such as from Ed Zahniser about this "grassroots" work—one person talking to one person to one person. It adds up to millions of people learning about a special place, having a connection to it, and being inspired to take action. This is the only way ultimately that we can find the boldness to protect intact landscapes and to defend wilderness into the future.

America's Arctic: Transformed in a Lifetime

[Map 1: North Slope Traditional Land Use Sites]

At the time the Arctic National Wildlife Range was established in 1960, this was the map of northern Alaska.[10] Think about it; this was before Prudhoe Bay was discovered; there were no major roads or industrial development. It was largely unbroken land, although there were already DEW Line stations every 30 miles or so along the coast as military radar "ears" for the northern front of the Cold War. There were Native villages. Although difficult to see at this scale, there were millennial old traditional land use sites scattered across the North Slope focused on the rivers, coasts, and some high ridges that were very important to the Inupiat people, and beyond to the south of this map traditional land use sites and places named by the Gwich'in people who were on this land since time immemorial.

So in the late 1950s, you're starting the conservation movement with many people who were not only adventurous but also pilots who were flying over this vast land seeing it largely as it has been created- and seeing how fast change was coming.

[Map 2: Alaska's North Slope]

The National Petroleum Reserve-Alaska in the west had been established in 1923 when President Harding set it aside as a petroleum reserve for the Navy. In 1976, Congress transferred it to the Interior Department, and in a Congressional rider in 1980 just after ANILCA passed, the Congress opened the area to the commercial oil industry for expedited leasing, although it also recognized it contained important special areas for wildlife, including at Teshekpuk Lake and Utukok Uplands that deserved undefined "maximum protection."

Refuge Life after ANILCA: Wilderness, "1002," and ANWR

[Map 3: Arctic National Wildlife Refuge: The Original Range (now Wilderness, Coastal Plain) and Refuge Expansion]

This is the map as I learned it in 1982 when I joined the Arctic Refuge staff. What had been an intact wilderness set aside in the Northeast corner of the state as the Arctic National Wildlife Range, was better protected by ANILCA as designated Wilderness, a good part of it, at the same time as the name changed to Refuge and the area was expanded in the South to add critical wintering areas for the Porcupine caribou herd and a greater range of habitats primarily south of the Brooks Range.

But now the refuge has this Coastal Plain left out of the Wilderness designated for the rest of the original refuge, what became known as "1002," the "1002 lands," or "1002 Area" (Pronounced "Ten-oh-Two"). What does that sound like? Not like a Refuge. The Coastal Plain of the refuge was defined by ANILCA's Section 1002 which specified this 1.5 million acres wedged between the Arctic Ocean and the Brooks Range foothills, and from the Canning River east to the Aichilik River, was to have one time seismic exploration studies of the oil and gas potential, as well as further baseline studies of fish, wildlife, and their habitats and a major analysis of potential environmental impacts from drilling.

Clearly, this map has shaped my life's work: to make that one map whole again. To make the Coastal Plain all designated Wilderness, so we don't have a "1002 Area" any more within the refuge. For a recommendation that the Coastal Plain Wilderness Study Area move forward will help achieve a clear mandate for the Fish and Wildlife Service, as well as each new Secretary of the Interior, to manage the Coastal Plain as an integral part of the refuge for these wilderness values which have in fact been part of its founding purposes since 1960—not as an "oil study area." We have the opportunity to achieve this step as a result of the Arctic Refuge Comprehensive Conservation Plan/ Wilderness Review currently underway administratively by the U.S. Fish and Wildlife Service. And I believe that ultimately we will pass Wilderness designation for the Coastal Plain by law in Congress.

Another thing that was new when I got to the Refuge was Senator Frank Murkowski (R-AK).[11] One of his best known statements from the Congressional debates over Arctic Refuge drilling was in 2001 when he held up a blank white sheet of paper and said, "This is what ANWR looks like 9 months out of the year… It's flat… it's ugly."

And actually "ANWR" was new when I joined the FWS. If there's anyone in this room who knows whether it

10 North Slope Borough, March 1979, Traditional Land Use Inventory. Traditional Land Use Sites Map in: The Inupiat View, Vol. 1(b), U.S. Department of the Interior, National Petroleum Reserve—Alaska 105(c) Final Study.

11 Senator Frank Murkowski served from 1981-2002, and Chairman of the Energy and Natural Resources Committee from 1995 to 2001. He became Alaska's Governor in November 2002, and appointed his daughter Lisa Murkowski to his Senate seat.

was agency staff letting the acronym catch on because it was too long to say Arctic National Wildlife Refuge or a formal policy shift, I'd love to know. Prior to this, Fairbanks folks called it the Arctic Wildlife Range. But then likely during Interior Secretary Watt's reign over the implementation of the Alaska Lands Act (ANILCA), values were lost as the short-hand name for the place became well known as ANWR (pronounced "An-war")—a "4-letter word" as I often tell people today.

One of my most remarkable jobs of all time was as a young biologist studying birds on the refuge, tromping in hip boots through tundra wetlands, discovering nests. I loved it. We associated the bird densities and diversities with broad habitat types of coastal plain tundra, repeating the plot surveys each week and over a number of years.

I was one of those field biologists glad to follow in the footsteps of Olaus Murie, or George Schaller, who spoke so eloquently earlier at this symposium, by spending months of observation time on the ground in the field. My first arctic field camp leader was a protégé of the Alaskan ornithologist Dr. Brina Kessell who had also been part of Murie's Sheenjek expedition. So, this enthusiasm for careful ground observation from that time was carried on to me in the Refuge. During our studies, it was the ground biologists and the airplane biologists whose perspectives often diverged. Now it's the field biologists and the computer modelers. We all have to do better to talk to each other more and also spend that time observing the real world.

The Muries set the stage so that more than published scientific journal articles resulted from their expedition. They took their slide show, their film, on the road. This tradition of grassroots work—grounded in facts but also inspiration drawn directly from the land—is why the refuge remains protected today. Lenny Kohm, with Glendon Brunk of Fairbanks and Richard Dale of Sonoma, California, put together a multimedia *The Last Great Wilderness* slide show after the Exxon Valdez oil spill. They took the slide show to Audubon and Sierra Club chapters around the country, an effort supported with volunteers and groups like the Northern Alaska Environmental Center. But as Kohm puts it, they "grew the choir" by going to grange halls, rotary clubs, and garden clubs in rural corners of America.

At field camp and from office mates, I was schooled in refuge history and purposes of ANILCA, as well as the changes wrought to the Coastal Plain section of the refuge carved out from the wilderness protection afforded the rest of the original refuge. The management of this area was implemented by its extractive industry opponents under Interior Secretary James Watt who favored oil, gas, mining, and anything but an ecosystem view of wildlife or wilderness management.

The rationale for the studies in section 1002(h) of ANILCA to assess impacts of oil and gas development, as well as in the underlying research in section 1002(c) was to have better baseline information upon which to make these assessments and for Congress ultimately to consider. But from the get go, the momentum was decidedly in favor of the oil and gas industry. At that time, most sentiments, even among many refuge staff, said "when" the refuge is opened we should do thus and such study. So often I reminded folks that it is not a matter of "when," it is "if." The perceived inevitability of sacrifice of a special place to extractive uses is a tried and true means of creating that reality.

Bird camp life had filled me with the vast tundra freedom, bird songs floating on the wind, a great burst of life in the long summer light.

Monitoring Seismic: What is Significant?

Eventually, I wanted to stay on so much at the refuge that I applied for a winter job as seismic exploration monitor for the one-time program mandated by Congress. During the winters of 1984 and 1985, I worked full time on the seismic cat trains, three weeks on, one week off, monitoring the operations. I drove on the tundra. The Arctic National Wildlife Refuge tundra. That fact has shaped my life ever since.

Ostensibly, we were there to prevent significant, adverse impacts from the seismic exploration. However, standards of significance had not been set in advance of our monitoring. The first winter of the program went forward despite clear lack of adequate snowcover across the windswept coastal plain, especially in the western hillier country (the required six-inch average snow cover was obtained by including probes of deeper drifts in the valleys to offset nearly bare ridges). If you tried to route the bulldozers to avoid an overwintering fish pool, you were going to run over riparian willows instead. We were sometimes successful in routing the heavy cat trains through snow filled canyons but more often such drifted routes did not coincide with the direction they needed to move.

Our field monitor reports described significant adverse impacts due to smashed tussock tundra, crushed willow shrubs, and torn up Dryas river terraces, and predicted these would result in lasting visible scars, if not damage to plant communities. Fuel hauler cat trains drove too close to a known polar bear maternity den along the coast and later the mother left the area without any cubs. Trespass on Alaska Native allotments took place despite clear instruction to avoid them.

Later, when press attention to the surface disturbance heated up, we were called to a monitor meeting, and significance was defined—to conveniently rule out the observations of cumulative damage that we had seen. A major part of our work was to measure snow depths even in -50 degree F and drive in rebar stakes (this was before GPS existed) so that summer vegetation plots could be studied along the seismic lines and camp move trails. Fortunately this was a very rigorous and statistically well-designed survey where vegetation plots have been sampled over the long-term.

The following summer, my tracks from the "Bomber" (Bombadier), a small VW-shaped tracked vehicle, showed up on the tundra along with virtually every other trail that had been made. Even today, there are still lasting visible scars, although they no longer grid the tundra like the first summers after the seismic surveys. To this day, significant adverse impacts to vegetation and permafrost persist. These one-time mandated seismic surveys in the Arctic Refuge resulted in long-term changes to natural habitat diversity including changes in plant species composition and permafrost stability reported by Jorgenson et al (2010):[12]

"*Recovery to pre-disturbance communities was not possible where trail subsidence occurred due to thawing of ground ice. Previous studies of disturbance from winter seismic vehicles in the Arctic predicted short-term and mostly aesthetic impacts, but we found that severe impacts to tundra vegetation persisted for two decades after disturbance under some conditions.... Climate change is likely to make permafrost even more sensitive to seismic exploration activity in the future.*"

That I drove on this wild landscape forever changed my understanding of the limits of mitigation, stipulations, and the values of wilderness. I learned that while most of the crew felt lucky to work in the Refuge and were respectful of my profession, my experience showed there was no way that such intensive activities could take place year after year as would be required for further exploration, drilling, and oil and gas development and production, and not destroy the basic integrity of the ecosystem, its natural quiet or its beauty. I am committed to that never happening in the Arctic Refuge again.

Fighting for Public Involvement, Upholding the Public Interest

Some of the history lessons are hard ones. Citizens sometimes must take to the courts to uphold the public interest. Environmental and Native organizations mounted key legal challenges so that the public had its rightful role in the process for the Coastal Plain Resource Assessment, ("1002 Report") required by Congress. The resolve and determination of watchful public citizens as an essential part of Arctic Refuge protection is important to remember. Here are a few of the key court cases:[13]

To Retain Fish & Wildlife Service Jurisdiction over the "1002" Studies and Report

Trustees for Alaska v. Watt, 524 F. Supp. 1303 (D. Ak. 1981), aff'd 690 F. 2nd 1279, 1307 (9th Cir. 1982).

On March 12, 1981, Interior Secretary James Watt transferred the responsibility away from the U.S. Fish and Wildlife Service to the U.S. Geological Survey (USGS) for the seismic exploration regulations and accompanying Environmental Impact Statement for the one-time program required by Section 1002,[14] including monitoring wildlife impacts.[15]

In a successful legal challenge brought by Trustees for Alaska, the U.S. District Court for Alaska ruled that full responsibility had to be reassigned to the Fish and Wildlife Service (FWS), and furthermore that the FWS had to develop new draft regulations, EIS outline, and exploration assumptions instead of using those drafted by USGS.[16] The court found it unlawful for USGS to lead the Coastal Plain study because the National Wildlife Refuge Administration Act requires that the Refuge System be administered by the Secretary of the Interior through FWS;[17] this was upheld on appeal.[18] Ultimately, the Fish & Wildlife Service also had the lead for the mandated baseline studies of fish, wildlife, and their habitats (Section 1002 h) and the Coastal Plain Resource Assessment and Report to Congress required in Section 1002 (c). However, an Interagency Work Group headed by FWS that oversaw the report also included USGS and the Bureau of Land Management which influenced its findings.

12 Janet C. Jorgenson, J.M. VerHoef, and M.T. Jorgenson. 2010. Long-term recovery patterns of arctic tundra after winter seismic exploration. Ecological Applications, 20(1): 205–221.

13 Other court cases include: Trustees for Alaska v. Russell Robbins, Civil Action A82-340 (filed
August 20, 1982; Settlement Agreement July 19, 1984); Trustees for Alaska v. Horn, Civil A87-118 dAK (filed March 19, 1987).

14 U.S. Fish & Wildlife Service, February 1983, Proposed oil and gas exploration within the Coastal Plain of the Arctic National Wildlife Refuge, Alaska, Final EIS and Preliminary Regulations. Prepared by USFWS in cooperation with the USGS and the BLM.

15 Amy Skilbred, Deanne Kloepfer, Susan Alexander and William C. Reffalt. 1984. The Watt/Clark Record: Alaska, Environmental Policies of the Reagan Administration. The Wilderness Society. P.9.

16 Trustees for Alaska v. Watt, U.S. District Court for the District of Alaska (Civil No. A81-264).

17 Pamela Baldwin, September 6, 2001, Legal issues related to proposed drilling for oil and gas in the Arctic National Wildlife Refuge, CRS Report to Congress, RL31115, p. 6.

18 Trustees for Alaska v. Watt, 9th Circuit Court of Appeals, No. 82-1307.

To Allow Public Review and Comment on "1002 Report" LEIS
Trustees for Alaska v. Hodel, 806 F.2d 1378 (9th Cir. 1986)

Next, citizens fought for public involvement. The Interior Secretary said there would be no public comment on the Arctic Refuge Coastal Plain Resources Assessment ("1002 Report") and Legislative EIS (LEIS) prior to sending them off to Congress. Instead, the department said they would just bundle up the public comments after the "1002 Report" and LEIS was a done deal and send it all to Congress.

On October 2, 1985, Trustees for Alaska challenged Interior Secretary Hodel's decision so that a draft Legislative EIS (LEIS) would be made available for public review and comment prior to the Final LEIS/ Report to Congress being sent.[19] On March 6, 1986, the District Court found Interior's actions to be contrary to the National Environmental Policy Act (NEPA), which has as its primary goal for the public to be involved in decisions that affect its lands and the human and natural environment. The Court required response to comments in the LEIS and that responses be available locally prior to the "1002 Report" submittal to Congress. The Interior Department appealed on April 4, 1986 but lost in the 9th Circuit Court of Appeals on December 23, 1986.

To Correct "1002 Report" LEIS Failures to Address Major Environmental Issues
NRDC v. Lujan, 768 F. Supp. 870 (D.DC. 1991)[20]

The Interior Secretary's 1987 Recommendation to Congress called for full leasing and development of the Coastal Plain in contradiction to the scientific findings of the "1002 Report"/ LEIS. The Department of the Interior had predicted that oil and gas development across the Coastal Plain would result in major impacts to caribou and muskox, water quantity and quality, subsistence hunting and fishing, wilderness, and recreation and significant effects to snow geese, wolves, wolverines, brown bear, polar bears, vegetation, and permafrost terrain.[21]

The report clearly found that oil and gas development would have major impacts incompatible with all the purposes of the Arctic Refuge: *"Oil and gas development would result in long-term changes in the wilderness environment, wildlife habitats, and Native community activities currently existing, resulting instead in an area governed by industrial activities."*[22] *"The wilderness character of the coastal plain would be irretrievably lost."*[23]

In 1989, conservation organizations representing 8.7 million members nationwide petitioned the new Secretary of the Interior Manuel Lujan to reverse policies about the Arctic Refuge. The petition filed by Natural Resources Defense Council (NRDC) and 12 other major environmental organizations plus over 100 Alaska Coalition groups from Alaska Center for the Environment to Wyoming Outdoor Council requested correction of major flaws in the "1002 Report."

Later that year, the Gwich'in Steering Committee filed a legal challenge to the adequacy of the "1002 Report"/ LEIS in the U.S. District Court of DC, and the Natural Resources Defense Council et al. also filed a similar suit against Interior Secretary Lujan. Later consolidated as NRDC v. Lujan (1991) [24] the case challenged the adequacy of the final LEIS under ANILCA and NEPA and said the "1002 Report"/LEIS failed to provide sufficient analysis of issues including:

- Effects outside the coastal plain:
  Gwich'in Subsistence
  Valdez Oil tankers (the Exxon Valdez oil spill had happened by this point)
  Cumulative Impacts
  Global Warming

- Impacts within the coastal plain:
  Water quality and quantity
  Air pollution
  Hazardous and Solid wastes

- A National Energy Plan Alternative focusing on renewables that didn't require sacrificing this area.

In 1991, the Interior Secretary submitted to Congress a new BLM report, the "1991 Overview," which increased Arctic Refuge oil potential yet did not identify data sources, nor had it been circulated to the public for review.[25]

19 Trustees for Alaska file on behalf of its members and the American Wilderness Alliance, Defenders of Wildlife, Northern Alaska Environmental Center, and The Wilderness Society; Defendants also included FWS Director Janzen and Alaska Regional Director Gilmour.
20 This case consolidated two cases: Natural Resources Defense Council, et al (National Wildlife Federation; National Audubon Society; The Wilderness Society; Northern Alaska Environmental Center; National Parks and Conservation Association; Defenders of Wildlife; and Sierra Club) v. Manual Lujan, U.S. Secretary of the Interior and U.S. Department of the Interior, Civ. A. No 89-2345; Gwich'in Steering Committee v. Manual Lujan, Secretary of the Interior, and U.S. Department of the Interior Defendants and Arctic Slope Regional Corporation and Kaktovik Inupiat Corporation, Defendant-Intervenors, Civ.A No 89-2393.
21 U.S. Department of the Interior (USDOI). April 1987. Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment. Report and Recommendation to the Congress of the United States and Final Legislative Environmental Impact Statement.
22 USDOI. 1987. p. 165.
23 USDOI. 1987. p. 164.
24 This case consolidated two challenges: Natural Resources Defense Council, et al (National Wildlife Federation; National Audubon Society; The Wilderness Society; Northern Alaska Environmental Center; National Parks and Conservation Association; Defenders of Wildlife; and Sierra Club) v. Manual Lujan, U.S. Secretary of the Interior and U.S. Department of the Interior, Civ. A. No 89-2345; Gwich'in Steering Committee v. Manual Lujan, Secretary of the Interior, and U.S. Department of the Interior Defendants and Arctic Slope Regional Corporation and Kaktovik Inupiat Corporation, Defendant-Intervenors, Civ.A No 89-2393.
25 Bureau of Land Management. 1991. Overview of the 1991 Arctic National Wildlife Refuge Recoverable Petroleum Resource Update.

In light of this, NRDC et al. filed new requests to the court on June 28, 1991 asking for the Interior Department to provide a Supplemental EIS on the BLM report. On July 22, 1991, the judge ruled that indeed the Gwich'in and environmental organizations had standing to sue under NEPA, and that the Interior Department had violated NEPA by not issuing the "1991 Overview" as an SEIS, and ordered that it be circulated as such for public comment on an expedited basis.[26] However, the ruling in NRDC v Lujan put off most other issues to later filings and decisions. The SEIS was never done, and later in 1991, the Court dismissed the entire case without prejudice, finding it moot after a Senate filibuster defeated the Bennett-Johnston National Energy bill (S. 1220) in which Arctic Refuge drilling was its centerpiece.

What's interesting about this today is to see how long it took the issues raised by this case—and that were being asked by biologists in the agency back then—to be addressed by scientific studies at all. Even today, many of these issues are still plaguing us today with huge data gaps both on land and offshore. It wasn't until the National Research Council tackled its major study in 2003, *Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope*, that some of these big gaps in understanding of impacts had even begun to be addressed.

Coastal Boundary Dispute over Arctic Refuge Lagoons
United States of America v. State of Alaska, No. 84 Orig. (June 29, 2000).

A big court case going on forever was the "Dinkum Sands" case in the U.S. Supreme Court. It concerned who owned certain waters of the nearshore coastline of the Beaufort Sea. The state claimed that submerged lands inside the Arctic Refuge's barrier islands—primarily lagoons and enclosed bays-should be State waters so that they could drill them. It was a very complicated case, but what ultimately what I want you to take out of it is the importance of agency heros. Fortunately, the precursor agency to the U.S. Fish & Wildlife Service (U.S. Biological Survey) had very good staff work back in 1957. They properly filed the right paperwork to set these lands apart for the purpose of the refuge prior to statehood. Without that, the coastal boundary could have changed so that the lagoons would no longer be part of the refuge. These habitats are an essential part of the diverse spectrum of Arctic habitats in the original refuge, and even the Porcupine caribou herd finds insect relief on the sea ice surface of these lagoons. It might be a very different landscape for that precious coastal estuary so important to migratory birds, anadromous fish, seals, polar bears and more. The Supreme Court ruled in favor of the Federal Government, so these vital nearshore waters were retained in federal ownership, as Arctic Refuge.

26 NRDC v. Lujan, 768 F. Supp. 870 (D.DC. 1991) Memorandum Opinion and Order by Joyce Hens Green, District Judge on July 22, 1991.

Double Jeopardy from Oil & Gas on Alaska's North Slope

[Map 4 : North Slope Oil and Gas Leasing]

Here's the general lay of the land today. We heard some from Dr. George Schaller this morning about this map. The Arctic Refuge is the only area of Alaska's North Slope and surrounding seas protected by law from oil and gas leasing, exploration, and development. It is really important to look at what surrounds the refuge in terms of existing and future oil and gas industrialization impacts and take these into account as we look at the next 50 years of protecting the Arctic Refuge landscape.

[Map 5: North Slope Oil and Gas Exploration and Development 1968 – 2008]

This Map shows the growth of the Prudhoe Bay oil fields by decade from the time of its discovery.

Today, as the industry sprawl increases and pressure builds for massive offshore development, we are much more aware of the double jeopardy posed by oil and gas development in the Arctic. More oil and gas development on land and sea will cause more Greenhouse Gas Emissions right in the place most rapidly changing, as well as further noise and habitat loss and fragmentation from the increased industrialization on land and sea.[27]

The oil and gas industry is the largest single contributor of greenhouse gas emissions in Alaska, according to the Alaska Department of Environmental Conservation (2008).[28] The Arctic is warming at double the pace of anywhere else on earth. At the same time, plants, animals, and people face not only effects of expanding oil development in the Arctic but also climate change stresses that add up to double jeopardy from fossil fuel development.

There's sprawl:

- 36 North Slope Oil Fields.
- 500 miles roads, 1,100 miles pipelines.
- 6,100 exploratory & production wells on 223 drilling pad.
- 39 oil production plants, gas processing facilities, water treatment plants, powerplants
- 38 gravel mines.

27 The Wilderness Society: Anne E. Gore, Broken Promises: The Reality of Oil Development in America's Arctic, 2nd Edition, 2009, (http://wilderness.org/content/broken-promises-reality-big-oil-americas-arctic).
28 Alaska Department of Environmental Conservation. January 2008. Summary report of improvements to the Alaska Greenhouse Gas Emission inventory. http://www.climatechange.alaska.gov/docs/ghg_ei_rpt.pdf.

There's pollution:

- Prudhoe air emissions detected 200 miles away.
- 70,000 tons of oxides of nitrogen annually which contribute to smog, acid rain, and greenhouse gases, in amounts twice that emitted by Washington, D.C. according to EPA records.[29]
- Other oil field pollution includes greenhouse gases including some 24,000 metric tons of methane, and 7- 40 million metric tons of carbon dioxide.[30]
- Black smoke and gas flaring plumes are the most visible air pollution.
- Since 1974, the oil industry has flared in excess of 150 billion cubic feet of natural gas. Natural gas flares are designed to burn waste gases during production, and as an emergency safety relief. Flaring can produce 100-150 chemicals including soot, nitrogen oxides, sulfur dioxide, hydrogen sulfide, propylene, benzene, toluene, methane, carbon dioxide and ammonia.

There's Greenhouse Gas Emissions:

- Oil & gas industry: largest single source of GHG emissions Alaska-wide.
- 15.26 million metric tons CO2 equivalent by Oil & Gas industry annually.
- Oil & Gas Industry is 29% of all Alaska GHG emissions.

There's toxic spills:

- More than one per day, on average. (ADEC 1996-2009).[31]
- 453 spills each year in the Prudhoe Bay oil fields and TAPS.
- Over 6000 spills of 45 toxic substances from North Slope oil operations.
- Over 2.7 million gallons were spilled, including some 396,000 gallons of crude oil during this period.
- EPA fined BP $20 million in 2007 in largest crude oil spill at Prudhoe Bay which was caused by corrosion, negligence and poor government oversight.

There's noise disturbance:

- Construction, all-year-round production.
- At the newer Alpine oil field, the promise was made to "minimize aircraft travel during the bird nesting season (June 1- July 15).

The prediction: 13 aircraft flights in a month (ARCO 1997).

The reality: 1,700-1,980 airplane and helicopter take-offs and landings during a 45-day period during construction, June 1 – July 15, 2000.[32]

Oil Field Impacts: Greater than Predicted

[Map 6: North Slope Oil & Gas Activity, with 1977 prediction]

This map shows the sprawling Prudhoe Bay oil fields today and depicts the extent of oil and gas was predicted to occur in the Trans-Alaska Pipeline System Environmental Impact Statement (Department of the Interior, 1977). No offshore development was shown nor was most of the Kuparuk oil field anticipated.

[Fig. 1 Cartoons:
Monument to Alaskan Oil Development by Etta Hulme (Fort Worth Star Telegram, 1988)
Fish and Wildlife Service Dress Code by Mike O. (1989)]

When I was at Fish and Wildlife Service, in 1987, we were asked to do a study of the environmental impacts of Prudhoe Bay and the Trans-Alaska Pipeline. These kinds of issues weren't covered well by the Coastal Plain Resource Assessment and Report to Congress/LEIS. It was quite a controversial affair, it was a very dramatic thing that happened, it was very hard on the staff, and that story could be told in depth later on. Here's a short version.

Congressman George Miller (D-CA), chairman of a key House committee, asked the U.S. Fish and Wildlife Service to answer the question, What are the predicted versus actual impacts of the Trans-Alaska Oil field and Prudhoe Bay oil fields on Alaska's North Slope?

By this time, I had moved over to Northern Alaska Ecological Services. Our office got the assignment because of our ongoing monitoring and studies of Prudhoe Bay. We systematically compared the estimates of activities, infrastructure, and pollution described by the Interior Department's Trans-Alaska Pipeline System Environmental Impact Statement from 1972, with the reality on the ground in and all the studies and data we could find in 1987. The answer surprised all of us.

29 U.S. Army Corps of Engineers. 1999. Northstar FEIS, Vol. III, Table 5.4-6, data from ARCO and BPXA, 1994, as reported to Alaska Department of Environmental Conservation. Emissions estimates based on fuel consumption for Prudhoe Bay, Endicott, Lisburne and Kuparuk oil field main production facilities but does not include Alpine, Badami, Pt. McIntyre, Tarn and Northstar oil fields or four Trans-Alaska Pipeline Pump Stations, nor emissions from drill rig engines or vehicles.
30 Jaffe et al 1995; Brooks et al 1997.
31 The Wilderness Society: Anne E. Gore, Broken Promises: The Reality of Oil Development in America's Arctic, 2nd Edition, 2009, (http://wilderness.org/content/broken-promises-reality-big-oil-americas-arctic).

32 Pamela A. Miller. 2003. Broken Promises: The Reality of Big Oil in America's Arctic. The Wilderness Society, Washington, DC. (http://northern.org/media-library/document-archive/arctic/drilling-impacts/broken-promises-the-reality-of-big-oil-in-americas-arctic-2003).

After about six weeks of study by our entire staff, a 66-page report, *Comparison of Actual and Predicted impacts of the Trans-Alaska Pipeline System and Prudhoe Bay oil fields on the North Slope of Alaska* was done. The regional office and other reviewers had given positive feedback and we finished last edits. But at the end of the day, we got a call and were told that the regional "1002 czar" said to "lock it in your desks." We sent our final report to Anchorage. Later we learned the Region sliced it down to about a dozen pages by removing data tables that were the meat of the analysis and references. Then about six months passed, the report still hadn't seen the light of day. Arctic Refuge drilling bills barreling through Congress had one last stop before going out for a vote: Chairman Miller's committee.

The report had documented many impacts that were greater than anticipated, including a larger geographic extent of oil fields including unforeseen offshore development, larger drilling pad sizes, and nearly double the acreage of wetland habitat lost. It documented inadequate monitoring of environmental quality and lax enforcement of environmental laws on Alaska's North Slope. [33]

Shouldn't this evidence be considered in the debate? Why didn't the American people deserve to have a more complete picture of the environmental costs of oil development, especially since such existing Prudhoe Bay and cumulative impacts had been largely ignored by Interior's "1002 Report."

The words of Olaus Murie, caribou ecologist and a key refuge founder, who had his own battles over disconcerting reality with the precursor agency of the U.S. Fish & Wildlife Service, echoed over and over in my mind, "*All a scientist has is his integrity.*"

Arctic Refuge drilling legislation had already passed through another key House committee, propelled by "grassroots" help from 24,000 ARCO oil company employees and the Alaska Coalition for American Energy Security. Polling results by ARCO's PR firm showed 57% of Americans agreed it was "important to protect Alaskan wilderness." Oil development proponents concluded that the "rest of the debate cannot be oil versus environment. Rather, the argument must be our oil versus their (foreign) oil and that the living laboratory at Prudhoe Bay proves that development and protection of wildlife values can exist together… that we can do it right." [34]

When the New York Times broke the story, "Alaska Oilfield Report Cites Unexpected Harm to Wildlife" (May 11, 1988) it pierced for awhile the illusion that oil development was well regulated, free of pollution, not harmful to wildlife habitats, and small. The release of the study had an impact. The next day, Fairbanks Daily-News Miner headlined, "Wednesday was a bad day for backers of ANWR opening." The Interior Department still had not sent Chairman Miller his requested report. By hearings in June, the Office of the Secretary finally sent him a four-page report with many opposite conclusions in sweeping generalities bereft of scientific data or analysis.[35]

It took more than a decade from the release of this suppressed Fish and Wildlife Service report for scientists to undertake another comprehensive evaluation of North Slope oil and gas industry impacts. The National Research Council's 2003 study of cumulative impact from the North Slope oil fields did find major significant impacts to caribou and other animals and their habitats on the North Slope.

In addition to investigating the suppressed report, Chairman Miller focused much of his inquiry at a series of hearings in 1988 on two bad deals for the refuge and the American public:

Chandler Lake Land Exchange—Interior Secretary Watt and Arctic Slope Regional Corporation (1983)

This land exchange was completed very quickly by Secretary of the Interior James Watt in 1983. This involved taking surface lands within Gates of the Arctic National Park that had been conveyed to Arctic Slope Regional Corporation (ASRC) and trading those for subsurface lands within the Arctic Refuge coastal plain. Under terms of the Alaska Native Claims Settlement Act (ANCSA), subsurface lands within existing refuges like the Arctic Refuge were not available for selection by the for profit regional corporation. Instead the lands beneath village corporation lands around Kaktovik were to be retained in federal ownership due to the known wildlife and subsistence values of the surface lands.

As a result of Secretary Watt's land trade, ASRC currently has a partial, contingent interest (restricted title) in certain *subsurface* lands within the coastal plain and the village corporation, the Kaktovik Inupiat Corporation (KIC), currently owns certain *surface* land interests on the refuge coastal plain. To acquire this contingent interest in the coastal plain subsurface estate, ASRC traded holdings on the North Slope near Chandler Lake valued at $5.1 million. For many reasons, a U.S. Government Accounting Office

33 U.S. House of Representatives. 1990. Arctic National Wildlife Refuge: Hearings before the Subcommittee on Water and Power Resources of the Committee on Interior and Insular Affairs, 100th Congress, 2nd Session. On H.R. 39, to Designate certain lands in Alaska as wilderness, H.R. 1082, Arctic Coastal Plain Leasing Act of 1987, H.R. 3601, National Fish and Wildlife Enhancement Act of 1987, and H.R. 4343, Arctic National Wildlife Refuge Energy Plan Act. Hearings Held in Washington, DC Jun 9 and 10, 1988. Serial No. 100-52, Part VII.

34 Minutes of Meeting, May 3, 1988, Alaska Coalition for American Energy Security (comprised of Alaska Oil and Gas Association, Alaska State Chamber of Commerce, Office of Alaska's Governor, Arctic Slope Regional Corporation, Standard Alaska-BP's predecessor, and others).

35 U.S. House of Representatives. 1990. Arctic National Wildlife Refuge: Hearings before the Subcommittee on Water and Power Resources of the Committee on Interior and Insular Affairs, 100th Congress, 2nd Session. On H.R. 39, to Designate certain lands in Alaska as wilderness, H.R. 1082, Arctic Coastal Plain Leasing Act of 1987, H.R. 3601, National Fish and Wildlife Enhancement Act of 1987, and H.R. 4343, Arctic National Wildlife Refuge Energy Plan Act. Hearings Held in Washington, DC Jun 9 and 10, 1988. Serial No. 100-52, Part VII.

investigation in 1989 concluded that the land exchange was not in the best interest of the United States.[36]

At the time of the land exchange, ASRC knew it could not develop the subsurface resource. When these land interests were acquired, it was understood by both ASRC and KIC that *oil and gas development was not permissible* unless Congress opened the Arctic Refuge to development and that the lands would be subject to the laws governing the purposes of the Arctic Refuge. ASRC has, nevertheless, *already* profited greatly from the contingent interest (restricted title) lands, having received at least $39 million in speculative oil lease options from BP and Chevron. The oil corporations drilled one exploratory well during the winters of 1985 and 1986 (its results remain confidential), and still have lease agreements with ASRC for lands within the coastal plain.[37]

"Mega-trade" (1988)

In the secretive "Megatrade" proposal, the Interior Department planned to trade away subsurface oil and gas rights for 133,000 acres of Arctic Refuge Coastal Plain lands to ANCSA for-profit corporations and their multinational oil company partners in exchange for lands with low threats in 7 different wildlife refuges. The Interior Department even held a "conditional auction" for oil and gas rights. This exchange posed a grave threat to the Arctic Refuge by setting up additional pressure to open it to the oil industry.

Fortunately, enough people got wind of that bad deal in time that exposed to public scrutiny; it was ultimately stopped, although the Interior Department persisted in completing an EIS on the proposal.[38] GAO's investigation also found this second land trade would not have been in the public interest, and found that "the magnitude of this exchange is without precedent in Interior." [39] Congress raised concern that the Interior Department's exchange would pre-empt their authority to decide the fate of the Arctic Refuge, and therefore amended ANILCA in 1988 [40] to prevent any further exchanges in the Arctic Refuge coastal plain from being done without its express approval.[41]

36 GAO. October 1989. Chandler Lake Land Exchange Not in the Government's Best Interest. http://www.gao.gov/products/RCED-90-5.

37 http://www.asrc.com/Lands/Pages/Oil.aspx (accessed September 17, 2011)

38 U.S. Fish & Wildlife Service, U.S. Bureau of Land Management and Department of the Interior, Office of the Assistant Secretary for Policy, Budget and Administration. 1988. Acquisition of Selected Inholdings in Alaska National Wildlife Refuges: Final Legislative Environmental Impact Statement.

39 General Accounting Office. July 7, 1988. Statement of James Duffus, GAO, before the Subcommittee on Water and Power Resources, Committee on Interior and Insular Affairs, House of Representatives. GAO/T-RCED-88-52.

GAO. September 1988. General Accounting Office. 1988. Federal Land Management: Consideration of Proposed Land Exchanges should be discontinued. RCED-88-179.

40 Section 201 of PL 100-395; ANILCA Section 1302(h)(2)

41 Baldwin, Pamela. August 22, 2002. Congressional Research Service Memorandum. Arctic Slope Regional Corporation lands and interests within the Arctic National Wildlife Refuge. 9pp.

Some Facts about "New Technology," "2,000 acres," and "Directional Drilling"

[Map 6: Arctic Refuge—2,000 acre Hoax]

I'm nearing the end of my time. Because all of you are advocates or educators in some way or another, I think it is important to come up with your own way of talking about the deficiencies of the arguments ("we have new technology and smaller footprint") made by those seeking to drill the Arctic Refuge. The oil industry has been using the same argument with identical words since 1978, when BP's publication *North Slope Alaska: Man and the Wilderness* said:

"The New Technology… Directional Drilling, ideally suited for North Slope operations, enables the reservoir to be tapped more than one mile from the pad… No unsightly drilling rigs are left to mar the landscape… Only a relatively small system of flow lines will be installed above ground to carry the oil from each well to the gathering centers. Formal cleanup programs keep Prudhoe Bay part of the wilderness. No longer do abandoned oil drums litter the areas."

I learned that the clear choice was oil versus wilderness—that despite the complexities in the situation, the fact is that you cannot have oil and gas exploration and development wilderness in the same place. Even ARCO Alaska's spokesperson Ronnie Chappell, said *"We can't develop fields and keep wilderness."*[42] Protecting these lands for their wilderness values is the single best way to talk about this issue and the stark choice involved. It is important to not be afraid of talking about it this way.

[Map 6: Arctic Refuge—2,000 acre Hoax]

You've all heard about the 2,000 acres. Many think that this was a scientifically derived number. But it was cooked up in a lobbyist office,[43] and delivered to a Senator, who put in an amendment that helped it to pass the House of Representatives, pass the Senate and reach President Bill Clinton's desk tucked into the budget bill as a rider where ultimately he vetoed it.

The 2,000-acre footprint was a very cynical move that's being perpetuated today. Arctic Power still distributes maps that show a compact square as the 2000 acres, shows it as the only proposed development area, and portrays that it would be the whole area that would be developed by oil and gas exploration and development.

42 Los Angeles Times. July 10, 1997. Alaska's delicate Arctic awaits new push for crude.

43 McMonagle, R.J. 2008. Caribou and Conoco. Lexington Books. P.63.

However, the potential oil that may exist in the refuge is scattered in small pockets across the coastal plain, according to the U.S. Geological Survey.[1] Therefore, roads, pipelines, and activity will be spread across an extensive area, fragmenting wildlife habitats and disturbing wildlife.

We did a mapping exercise that showed how much could be allowed using the 2000 acre requirement as provided in Congressional bills, with the acreage of roads, pads, and pipelines, and the facilities that would be allowed. It is not one compact spot, would sprawl across the whole Coastal Plain area.

The latest scheme is a so-called "directional drilling" bill to open the Arctic Refuge to the oil industry is a Trojan horse to pry open the entire 1.5 million acre coastal plain of the Arctic Refuge to leasing and oil production. Senator Lisa Murkowski has said, masking its true effect, "those concerned about the impact to wilderness will be able to enjoy and preserve the refuge exactly as it is today."

In fact, the legislation would allow destructive seismic exploration and exploratory drilling across the sensitive 1.5 million acre coastal plain, along with fostering intense drilling along the Arctic Refuge's Canning River border and development along nearly 100 miles of fragile Refuge's coastline. Directional drilling will result in spills and pollution to this sensitive estuary, just like conventional oil drilling, with inevitable spills into key wildlife, wilderness, and subsistence areas. Furthermore, the tricky legislation could result in permanent roads across the coastal plain as there appears to be no restriction on permanent facilities like water reservoirs, mines, ports, or airports if built for exploration. Like other drilling bills, this would also waive vital environmental laws and erase the reasons the Refuge was originally set aside 50 years ago—to protect "its unique wildlife, wilderness, and recreational values."

Protecting the Refuge from Threats Beyond its Borders

[Map 7: Beaufort Sea & Chukchi Sea Leasing and Drilling]

Riches of the land and sea are both at risk.

One factor known at the time of the studies I was involved with as a researcher, was that the cumulative effects to polar bears for example, would be major if there was onshore and offshore development—more significant due to the combination of oil activities. We're seeing the offshore development as a very big factor now, with very big unknowns with respect to the biology of the marine and coastal estuary environments. The proposed drilling is very close to the refuge, as you look at the map, the red is where there are leases or have been leases in the last lease sales. The proposed wells in federal Outer Continental Shelf waters of the Beaufort Sea are only 16 to 23 miles away from the Arctic Refuge coast line but other existing OCS leases are closer and future lease sales could bring additional threat. Furthermore, leases in state of Alaska waters are closer, and new lease sales for waters adjacent to the Refuge occur every year.

The challenge is how do you protect the refuge if you don't pay attention to risks of spills, noise disturbance, and asking how they are going to get the infrastructure back to the Trans-Alaska Pipeline when the area on the far right of the map especially east of Kaktovik and all the way to the Canadian border is over 100 miles from existing facilities in some places. Over the past three decades there's been a lot of seismic exploration off the coast of the refuge and it continues.

Looking to the Future

We need to look at renewable energy alternatives. Today, the rubber is meeting the road as we grapple with the opportunities and environmental impacts of energy sources that can mitigate greenhouse gas emissions into the future. We need to come up with smart solutions.

In this time period of my career, my life, I've met amazing people along the way. People have travelled, travelled, travelled, been away from home, they've had visitors to their home again and again to protect the Refuge. And it will keep going on. But, what I have learned more than anything else is how much fun it can be to get out on the land and share it with people. To share your love of this special place is an important part of protecting its wildlife, its wilderness, its unique landscape.

At fifty, the Arctic Refuge holds valuable lessons to our 21st century challenges of living sustainably and bringing new energy paths to fruition that don't require extraction of fossil fuels in our treasured places and that reduce global warming pollution. The Arctic Refuge with its time, freedom, and space along with millennial old cultures rooted in this place offer recurring lessons. This is a human value of wilderness that is our obligation to pass on.

So be bold, only you can do what must be done. And don't settle for less than protecting the whole Refuge! Thank you.

Dr. John Hobbie: "Ecosystem Research on the North Slope: Changes in Ecological Processes over the Next Century"

So, we'll sort of take it in chronological order here. I started in Alaska back in 1958 as a graduate student. I wanted to show you some of the places I'm talking about, and the first place was Lake Peters, which is up here in the Wildlife Refuge. It's way over here, you can see on that map. And then I spent a lot of time at Barrow on a big project. And then, recently, since 1975, in Toolik Lake, which is now a field station of the University of Alaska, Fairbanks. And the same places set up, Lake Peters, here's Porcupine Lake, Toolik Field Station in Barrow.

I want to give lots of credit for the wonderful publication that has come out of this Wild Reach Project. A number of you in the room were probably on the list of authors here, and it is excellent, and it talks about sort of a landscape view, the changes that are going on now, and will be going on in the future, and how this is going to affect the wildlife response.

Now, George Schaller set it up for me and said it well, but we also think about the processes that are going on; just sort of looking at the landscape and observing, recording all the changes, that's part of the entire picture. I'm a process person right from the start; I'm an ecosystem scientist, and it's a little different.

So, I'm going to start by talking about Lake Peters and Lake Schrader here, which are in the part of the Refuge that sticks up towards the ocean. Here's the Hulahula River, and here's the Canning River over here, and of course, the crest of the Brooks Range is back here.

Now, in 1958, for very complicated reasons, I was trying to tell Matt Nolan how we ended up there, and it took me over half an hour, so you're not going to hear anything about that. But this was the project: I worked in Greenland in 1957, and we went here in 1958 with the USGS. We had a hydrologist, a meteorologist, an Army Quartermaster Corp, et cetera.

So, Lake Peters… On the way there, about June 8th or so, we actually landed on McCall Glacier on the way in: the most terrifying flight of my life, where the airplane, on skis, hadn't taken off yet before we went over the edge of the glacier, and we survived. It only happens sometimes, Matt says.

One of the highest peaks is Mt. Chamberlin. Glaciers, glaciers feeding into Lake Peters here. Lake Schrader is next to us here.

As Matt explained, Leffingwell explored this region, and he was smart enough, he named all the big mountains there; I think they were members of his graduate committee. And some of the names like Chamberlin, G.C. Chamberlin, figured out the Wisconsin, the Illinois, and the Kansan; all these names for the different glacial stages are still with us today.

He was a very important figure, and Leffingwell… I think you all should read this wonderful 1919 USGS professional paper. It's much more than just a dry paper. This is adventure.

Well, we landed, flew from Fairbanks in Wien Alaska Airlines, Keith Harrington, you may remember him. And we're taking in equipment with a C-46 plane, big cargo plane, World War II. And we reported back that the ice was strong enough, and then it turns out it wasn't strong enough. And so the plane, talk about littering the land, the Arctic Wildlife Refuge... it wasn't the Refuge then, so it was okay, see. And so Wien Alaska sprang into action and we loaded the plane with oil drums and inner tubes, and there it is down at the end of the lake. They towed it down using my research here with a 4.5 horse engine, it took awhile, and pulled it up onto shore with these big pulleys and various things. Got it up on shore, they put in a couple of green mechanics, one was a part-time bartender on 2nd Street and one was a guy from Barrow. And they worked all summer and they got it ready to go and then actually took it off on this pattern ground between the two lakes. I'm glad I wasn't there. So, then it sat down at Fairbanks Airport for many years. I used to see that old plane there, and it was still working. I don't know what's happened to it now.

So, that was why our research camp was where it is: that's where the airplane went in. It's up in this valley, the Lake Peters Valley here. We can see this Lake Schrader in the foreground, absolutely. So, this is more in the foothills, and this is up, obviously, in the mountains.

Rich Wien flew us; we went back to Kaktovik, and then later on he flew us out and landed with his Super Cub. He was 18 years old then, and then he took over as a captain in the Wien Air System, et cetera, et cetera. And you can see still the plane is out there in the ice.

Frank Riddle, our camp manager, was a very famous man in the Arctic because he was one of the three people shooting at the mad trapper back in 1932, who killed a

constable over in the Rat River, which was in the Yukon Territory. He hadn't reformed too much by this time.

There I am with my ship that I did most of the study with in 1958. The first thing that struck me was the tremendous big fish in this lake; the lake trout here, this is a meter long lake trout. The only fish I ever saw inside those lake trout were 18-inch arctic char, always the same size. Very stable, highly evolved system. I never saw any of the small fish; they were all hiding somewhere, because if they just showed their head out, they would have gotten eaten. And grayling were also in the lake. I also saw six lemmings inside a lake trout once.

So, how do they survive? It turns out of our biggest studies that we actually were able to age these lake trout, and some of them get to be big, very big. These ones weren't so big, but they were still 50 years old. So, those big lake trout are very ancient, and seemed that way to me. On the North Slope, I think now the law is that you have to release the fish; you can catch them but you have to release, based partly on this kind of data that we provided to the Alaska Fish and Wildlife. So, I don't know how that figures in the Wildlife Refuge. I just don't what the rules are there. So, lake trout…

When we flew in from Kaktovik, we flew right over the calving grounds. They were spread out. I didn't know I'd never see that again, and, sitting in the back of a Super Cub, I didn't get much pictures; wish I had. And then the whole Porcupine caribou herd encircled the whole lake, a four-mile-long lake, on July 4th. They were so incredibly tame we could walk right through the herd and they'd pull back a couple hundred feet or so. A grizzly bear walked right through the middle, and they just pulled back a little bit and gave him a nice stretch. I wish I'd gotten a nice picture of that, too. So, I watched the herd and tried to estimate how many they were, without any success; certainly 20,000 or 30,000.

There were mountain sheep, many dall sheep, in the valley, of course.

And there we have a picture of the head of the Naval Arctic Research Laboratory, Max Brewer; Bill Holmes, who set up this expedition; and Frank Whitmore, he was then the director of the USGS. Where are they now?

So, we got visited towards the end of August by Clarence Rhode, who was head of the U.S. Fish and Wildlife, their regional director, his son, and Stanley Fredericksen. And I took a picture while I was in this place here. I guess we don't know who was piloting. The point is, they took off and went over to Lake Schrader. I was down there sounding and messing around with the water, and they were never seen again. The plane was found 21 years later. So, this is the picture of that N-720 plane. And of course, the crash was over in the Ivishak River. They'd checked our camp to see if we'd been eating mountain sheep.

According to Frank Riddle, he was alone in camp several days later, out of meat, and saw a caribou swimming, and he went out and harvested it. He had it in the boat on the way back, and all the sudden there were six Fish and Wildlife planes circling Lake Peters. So, he told everyone that wreck in Barrow had actually killed this caribou, and everybody camped there in part of this gigantic search.

Clarence Rhodes was over here, in Porcupine Lake; they had flown up to Porcupine Lake and they flew over here to Lake Peters. And then it's unclear whether they went back, but the crash scene was down in this region here. So, it's extremely difficult to get to, and they had a million dollars worth of search going on.

Now, here is this little bit of science about Lake Peters. We have this turbid water coming from this very bad thing that's happening up in the headwaters; the glaciers are grinding up the mountain and providing all this turbid water. Well, this is no good, and I hope that Matt is here to take some notes and change his talk a little bit. We see that during the summer, Lake Peters is extremely turbid. That's a percentage of light that is transmitted in half a meter of water. So, not much light gets into the lake. Under the ice the lake is very clear, you see, about 80% transmission. And then, the lake fills up with this nasty glacial material just within a week or so, and finally, the whole thing is turbid again. Well, the algae that I was studying are having a very hard time.

That's Lake Schrader. Here's Lake Peters; we see under the ice that the primary productivity, which is the photosynthesis going on, measured in 1959 was very high for Lake Peters, up to a value of 20. And then here, we see ice cover in October; the lake gets more and more turbid and cold, but then, during the summer, and then very little light getting through during the year. Then, finally, primary productivity is again up to a value of 10 or 12. Well, when Lake Schrader's clear, the value is up to 160, and in this year the ice lasted until the end of July. So, over half of the total primary productivity occurs under the ice; when the water is nice and clear, a lot of light gets through.

So, I hope that when Matt gives his talk again, he will think about the algae and the value of primary productivity. Matt talks about how great this nasty stuff is for the birds out there. He's out of his field, Matt. But it was a nice talk.

My wife came up and we over-wintered. My brother, Chuck Hobbie, who's in the office, came up as a research assistant after we had to send my wife home; the baby wasn't born until the end of August. Camp was supported by flights from Barrow. We had everything that we needed, and flights every two weeks. My wife took the winter here; it was minus 20, but it was nice and calm, and she did extremely well doing her reading for English courses the next year. The planes out of Barrow: Barrow had it's own little Air Force.

Well, talk about a mess: this is Barrow region back in 1970 and '71, with vehicle tracks on these old lake basins that have now formed all these patterns of small lakes, all this pattern ground. And there we were doing research; this is this large international biological program, worldwide project, and one of the five U.S. contributions was the big research program at Point Barrow. And you can see its small marsh grasses, carrocks, et cetera in this (unclear) flat ground.

We had power out there, and so we were able to do research in the field. We used these lakes as experimental objects: we fertilized some, we added oil to some. They were only half a meter deep. We had 28 people working on these little ponds, so we had to have an aerial tramway so they wouldn't march around in the pond and mess everything up.

And this was a whole system study, where we were studying the flux of carbon, nitrogen, and phosphorous. And of course, that is what's different about a lot of this research. We are worried about nutrients: one of the processes that are really driving the plant growth, driving the change of vegetation, et cetera. No fish.

This is a book that we published, "Limnology of Tundra Ponds." It's available on the Web, along with the sister volume of the terrestrial side of the project. I just wanted to point out to you, you add a little phosphorous to the pond, and the primary productivity shoots up. We didn't add enough, so we added a lot more, "bang;" a couple of days, and everything is really chugging away at a very high rate. Intensive plots of this was phosphorous flow, the distri-nitrogen carbon.

And finally, a few words on the LTER Project, Long-Term Ecological Research Project, beginning in 1975 or 1980 over at Toolik Lake. It's part of a network of 26 projects around the world. Here is the pipeline road, and down here is Toolik Lake, because this where we could get to in 1975; when the road opened up it was a real… Didn't have to fly everything in. And here is the road, and we see the effect of dust on the road. This is a greenness plot, so a couple hundred yards either side is a dust-effect.

A nice series of lakes and streams; we could study changes in chemistry and microbes, all sorts of things, as it went along. We had a nice food web study, which showed that, in fact, those big fish were actually being

Bob Krear

Sheenjek Expedition, 1956. Don MacLeod and Olaus Murie doing field research.

fed by, most of their carbon and nitrogen was coming out of, the benthic organisms. A lot of them are eating snails that are feeding on the primary producers that are on the rocks: diatom films, et cetera. So, they are not really a pelagic food web; it's a benthic food web.

In terms of the value, what's the value of long-term study here? This study has been going on since 1975. Well, here is the river discharge; the spring discharge that used to be in June is now in May. So, there's been that much shift over our time. The magnitude of the discharge hasn't changed; it's about the same size, but it's now weeks earlier.

Thermokarst, as we heard, dumps… the permafrost melts, breaks down the stream, and the river downstream has high amounts of ammonium, phosphorous, and lowers amounts of nitrate.

Fish growth measured every summer: The adult grayling, in fact, thrive when the discharge is high here, and the young of the year, just hatching, they thrive when the discharge is low, so they don't get washed downstream. So, the best thing is to sort of alternate; one year have very low discharge, and you get a good crop of the young fish, and then in the next year, they grow a lot better because it's a lot higher, this discharge. Fertilization helps very much, too, but we don't want people dumping nitrogen fertilizer in these streams, either.

Experiments: Just a list without really telling the results. You saw some of these things; heating and fertilizer is a part of it, removing species, adding snow, excluded herbivores, changing pH, temperature, light. So, we get an idea not only in the terrestrial (unclear) system but also in the streams and the lakes.

What's going to happen in the future? You saw pictures of this. One of these is where the fertilizer had been applied, plus heat, and this one is a heat happening, no fertilizer. That lags a little bit, but the same thing is happening, indicating to us that it's the warming of the tundra affecting the breakdown of the organic nitrogen in the soil, making it available to the plants, that is really changing the shrubs, the amounts of shrubs, et cetera.

Finally, I wanted to mention fire, because it looks to us as if the fire and the permafrost melting are the two things that are going to really be affecting the landscape over the next 50 or 60 years. There was a very big fire about 30 miles away from Toolik Lake; we always thought it was too wet to actually have a big fire happening. And in about 2007, it started in July, it didn't really get going until September, when the lakes are all frozen; those little white things are all lakes around this region. These are satellite views, it's a big fire, about 10,000 kilometers square; excuse me, 1,000 kilometers square—still big.

And we mentioned fire a couple of times; so, this is the BLM map of where wildfires have happened since 1960. Here, we see this is 2005, and this, of course, is the Refuge area, so there haven't been very many at all. I don't know if that in 2007 was actually in the Refuge or not. These are the over-time number of fires that they have recorded. The picture of the lightning strikes has gone up like this, too. Is that tied into the changing weather patterns due to the retreat of the ice? I would probably think so, but that's something we should think is going to happen a lot more in the future on the Refuge.

We used flux towers to measure the carbon dioxide and you see the effect; unburned, moderate, and severe.

So, the albedo changes over time, the net ecosystem exchange of carbon, all those things are a part of our understanding now, and part of the modeling that we can bring to it. Here is daily carbon flux; this line here is a model, and these are the actual data and other points.

So, we are able to model this using photosynthesis: the amount of carbon, the amount of nitrogen in the system; put it all together in a big model and use the average temperature, the amount of solar radiation for the whole Kuparuk Watershed—this is 10,000 kilometer square—and using satellites to measure the amount of leaves that are there, and that correlates very well with the amount of nitrogen. And finally, come out with a measurement estimate of the primary productivity of the whole Kuparuk System, 10,000-kilometer square. Obviously, in the foothills region it's the richest.

We model it, and I won't go into that, but I will summarize, then, and say that in the future that below-ground processes are changing. You can't see them, but we can measure them if we have a long enough time. It doesn't do a two- or three-year project; it doesn't do a 10-year project. You need more time to get rid of the year-to-year. (Great variability).

Nitrogen is being released from the inorganic nitrogen. Nitrate is going up in rivers over this time. Shrubs are growing more, the mushrooms are changing species—a functional shift. Shrubs capture more snow, warm the soil, so it's a feedback. Caribou migrations might change because this birch that has taken over these small chambers is supposedly not too edible for the caribou; it's got a lot of resin on the twigs, et cetera.

Lakes and streams will eventually be affected by the soil processes: more nutrients, mosses can take over streams, lake trout can't survive the warming.

As I mentioned, the most important processes in the future will be permafrost thawing and fire.

Stephen Brown: "Avian Conservation in the Arctic"

We're going to go on a scientific expedition together, which I hope you'll enjoy; we're going to go to the Arctic National Wildlife Refuge from the point of view of a bird biologist.

Many of you have had a chance to meet some of the crew of biologists that's here with us that's been working on this project with us. I'll introduce a few of them to you along the way, and I hope it will be a chance for you to briefly share in our passion about the conservation of some of the most remarkable birds of the Arctic.

So, we're going to start just by introducing the cast of characters, and one thing you'll notice about shorebirds is that they can be strikingly beautiful, as you see in this photo from *Arctic Wings* taken by Subhankar Banerjee. Just standing up on the tundra, this is a long-billed dowitcher; they're striking birds that have remarkable life histories. This American Golden Plover will spend the winter in Argentina. This is a young Dunlin that was just born, and, without anyone showing the way, it will spend the winter somewhere in Asia. This is a Red-necked Phalarope, a very common species on the North Slope. There's a big mystery about what's going on with these birds: there used to be about 2 million of them stopping over in the Bay of Fundy; there are now, at most, about 4,000. We can't figure out where they go, and, just as an example of how little we know about shorebirds, we don't know whether to look for them in the ocean off of Peru or in the ocean off of Africa; they could be overwintering in either of those places. It continually amazes me that, in this day and age, we know so little about our birds and what resources they need to survive.

Shorebirds are also highly aggregatory creatures; they occur in large groups and amaze us with their aerial acrobatics and large flocks. But collecting in large numbers also makes them vulnerable, and one thing that's true about almost all shorebirds is that they're declining dramatically at alarming rates.

So, here are some data from a paper we put together a few years ago based on the International Shorebird Survey, which was started by Manomet back in 1972. You'll notice that the rates of decline of these species are truly alarming. Things like American Golden Plovers are declining in the northeastern United States at 7% a year. So, imagine for a minute that you just got your back statement, and it told you that you'd earned a negative 7% interest over the year; you'd probably move really fast to take your money out of that bank account and put it in a better place. That's basically what we need to do for these birds. The rate of decline is alarming and not sustainable, and will lead to the endangerment of many of these species in our lifetime if we don't take significant conservation action.

One bird that's one of the most common on the Arctic National Wildlife Refuge is the Semipalmated Sandpiper. Just to give you an example of the kind of declines that are occurring, take a look at these data: in the 1980s, we recorded about 2.1 million of these birds on their wintering grounds in South America; when a group of our colleagues went back in 2010, they could find only 400,000 in the core of the species' wintering range. That's a decline of 80% over 20 years of one of the very most common birds that nest in the Arctic National Wildlife Refuge. So, we're talking about significant declines and species that are on the verge of becoming endangered.

The world is a very big place, and if you think about it from the point of view of a shorebird, they're going to be nesting in the Arctic, way up here, and many of them winter as far south as the southern tip of South America. So, their migration is an important part of their life history, and the struggle to find stopover sites along the way and wintering sites to survive over the winter is a big part of the challenge facing them.

One of the things that fascinate me about shorebirds is, back in biology class, you were probably taught that species diversity is higher in the tropics and decreases as you go toward the poles. Well, for shorebirds it's exactly the opposite. So, you can throw out that old lesson. As you go north, you find more diversity of shorebirds and higher abundance of individuals. One of the remarkable things about them is a sentinel Arctic species.

So, just to give you a quick idea of what it's like to be a shorebird, we're going to take a very quick trip with a Semipalmated Sandpiper. So, we're zooming in on the North Slope and we're going to go visit the site of a nest of a Semipalmated Sandpiper that we found in the Arctic National Wildlife Refuge out on the Coastal Plain.

The first part of the migration is relatively easy; the bird's only going to fly entirely across Canada, which they do in a matter of a few days. They collect in a very important staging site along the Bay of Fundy, where you can find hundreds of thousands of them in the right time of the fall collecting to feed on the intertidal mudflats there, some of the biggest tides in the year.

USFWS/Steve Hillebrand

Tufted Puffin in Arctic NWR.

The next part of the migration is really tough; they're going to fly 2,500 miles nonstop over the Atlantic Ocean. And remember, these are birds that live in aquatic environments, but they can't swim, so if they land in the ocean anywhere along the way, that's the end of their story. They come to spend what we call the winter—but it's really summer down there—in Guyana, Venezuela, and around to the coast of Brazil on the extensive mudflats along that part of the coast.

After spending their time there, they start back north, but using a different migration route. Notice, now, we're flying over the Gulf of Mexico, and we'll talk about that more a little later. They stop in places like Cheyenne Bottoms, anywhere that there's undisturbed wetlands available to them along the way, and then start a short-hop migration strategy: instead of these long flights, they fly from wetland to wetland, working their way up through the Great Plains and into British Columbia and across the rest of Canada, sometimes coming back to the exact same nesting cup that they used the year before, if you can imagine that.

The most remarkable part of that journey, to me, is made by the juveniles, which do the same trip, but after the parents have already left. The juveniles follow in their footsteps, on a path they've never been shown by anyone, and find their way to these same wintering grounds; truly remarkable.

So, we're going to go now up to the Arctic National Wildlife Refuge, and we're going to go look at the first part of our expedition in the "1002 area". We started working there back in 2002 to try to understand how many shorebirds were using the area and what habitats were most important, particularly in this threatened ecosystem.

It's not an easy place to get to, as you know, and, when we pulled to a stop on what was supposed to be a frozen lake, but which you can see is actually a pile of slush, we disappeared in water and got wet inside the plane. Dirk from Coyote Air summed up our situation very succinctly by saying, "Bummer, dude!" That was his way of telling me he wasn't going to come back to where we were ever again! So, he dropped us off, and after hiking our gear up to the nearest piece of land we could find, a mile and a half away, we started looking for an actually frozen lake, and, a week later, had the rest of our gear in. And that just gives you an idea of what it's like getting into some of these places.

We're coming just as the birds are coming to try to catch the beginning of their nesting period. We set up little camps and worked from there on plots, and we're setting out now to try to understand, of all the different kinds of wetland habitats on the Coastal Plain, which ones are the most important for these nesting shorebirds.

Nesting shorebirds are very hard to find; this is a Stilt Sandpiper doing its Monty Python impression of how not to be seen. And, believe me, they're very hard to find. You would never find this bird walking around the tundra looking for it. So, we find them by display and then tracking indicated pairs by their nesting behavior, and then use that to extrapolate numbers.

So, we published the results of the survey looking at the entire "1002 area". It was the first time there'd been a well-designed, statistically-based sampling plan to look at numbers of birds across the entire area. And you can see some interesting, big patterns right away that jump out at you: in the thaw lakes around the Canning River Delta, we found some of

the highest densities of nesting shorebirds anywhere in the area, and then other concentrations located around things like the wetlands upstream in the Jago.

We also were able to look across all of the habitats within that area, some of the different kinds of areas, like these thaw lakes along the coast, or tundra inland, and to start to look at what each species needs. So, just very quickly, those Red-necked Phalaropes that I mentioned: 2 million of them are missing. We tried to figure out what habitats were important to them and found that they really like those wetlands in the Canning River. They had their highest density in wetlands, and very little use of any other habitats, you know. And they're aquatic foragers, so there are special parts of the "1002 area" that are important to them.

In contrast, Semipalmated Sandpipers occur really widely across the area and can use a wider range of habitat types, but they still have high abundance in some of these very high-shorebird areas along the Canning River.

So, those are just some quick examples of the kinds of results that we had from that work.

Some summary of what we found there: are an estimated 230,000 shorebirds using the "1002 area", which is about 2% of all the shorebirds of those species that we think exist in North America. And, particularly for species like Golden-Plovers, which, remember, are declining at phenomenal rates, we estimate that 8% of the entire population is nesting in the "1002 area." Those numbers are big enough to classify the "1002 area" as a Ramsar Wetland. Ramsar is actually not an acronym; it's the place where the Wetlands Convention was signed, so I don't have to tell you what Ramsar stands for; it's just a place. But it also qualifies the site as a Western Hemisphere Shorebird Reserve Network site. So, we were able to say that the site will qualify for those kinds of protections.

Densities were extremely high along the Canning River, as I mentioned; they were as high as the densities that we found in the Teshekpuk Lake Special Area, which, on average, was one of the highest densities of shorebirds found around the North Slope. And in the wetlands of that area, we found even higher densities. I'm not going to talk about the Teshekpuk Lake data today, but it's one of the real hotspots of shorebird nesting on the North Slope.

After we finished that breeding study, we started thinking about the threats to shorebirds that were most pressing, and with lease sells proceeding offshore, we started working on the use of the coastal zone by shorebirds.

The next step of their life history after they breed is that they go out to the coast, and they're about to head off on that migration I showed you. So, stop for a minute and think about what that requires; they have to double their bodyweight. So, for you or me to do that, we would have to eat 1,600 hamburgers over the course of 30 days. If you can imagine doing that, and doubling your bodyweight, and then getting up on day 31 and running to Mexico without stopping to eat or drink, that's what these birds are facing. So, there are very few places in the world where they can find those 1,600 hamburgers, and it turns out that the coastal zone is one of those very few special places where there's an enormous abundance of invertebrates—their hamburgers that they can eat quickly and gain all that weight.

So, we set out to survey the entire coastline, which had never been done for shorebirds. It was a bit of a daunting task, but Steve Kendall and I—Steve is our partner in the Arctic National Wildlife Refuge - sat down with Ave Thayer and planned how we could go about this, and we decided to survey all of the major river deltas. We set out to do it really having no idea what was out there, and it really was sort of basic biology exploration, going to see what habitats were being used and in what numbers. So, we laid out all the places we wanted to go, and we set out to go there, over about 138 miles of coastline and 18 different river deltas.

This is our research vessel, and this is sort of an example of the way we worked. We talk a lot about partnerships, but this a real partnership. We bought the boat, and the Refuge provided the engine, and we set out together to go find where the shorebirds were.

So, you get out on the coast and you have these barrier island systems, you have extensive mudflats behind them that we looked at earlier, and those are the areas we needed to go out and survey.

This is on the Okpilak, and it's a good example of the kinds of extensive mudflats that you find at the larger river deltas.

So, we also had camps set up over several years looking at longer-term use of the areas that Steve was working on for trying to understand use of each of these major river deltas. The coastal survey went all the way to the edge of the Refuge in both directions, and sometimes we had to pause and wait for the ice to clear so we could finish.

We were also doing surveys for avian influenza, which I'm sure you've heard about in the news. The risk was that it would come over with some of these migrants from Asia, and I'm happy to say that so far there's no evidence of that having happened. People were worried about it being bad for people, but it actually would have been very bad for the birds; they don't do well when they get infected, they tend to die very quickly. So, we're very glad that that hasn't happened.

So, we're out on the ocean tooling around between all these sites, and this is an average day at the office: you get to a river delta. No one's ever walked into the shore to

look for shorebirds there. You anchor your boat and you set off for shore and you hope that somewhere out there is an actual mudflat. And as you get closer, we went out to predetermined transects that we laid out across the mudflats and surveyed them for nesting shorebirds. And you hope the boats there when you get back at the end of the day. So, we always GPS'd it because the fog there can come in in just minutes, and you're completely lost. The mudflats are large and extensive and completely flat and very featureless, so it's easy to get lost out there in the fog.

I took this picture of Steve on our way to Demarcation Bay the first year we were doing the survey, and he was cross with me for taking it because I had to make him slow down a little; it was bumpy and I had to dig the camera out. But it's appeared a lot, and I'm really glad we have it just to show what it can be like out there on the water. Steve's looking kind of grim, there, because it was a very long, cold day getting all the way to Canada in our little boat.

We're dealing with weather; you saw pictures of this storm earlier, but this is what our boat looked like during that storm. It took me about two and a half days to recover from that, clearing out the boat and refashioning an anchor; we had lost our anchor and lost the anchor line. And so, it can be challenging working out there.

We're also always looking over our shoulder for polar bears. The first year we were out there, we saw one, and then the numbers went three, five, seven, and then nineteen. So, we saw a dramatic increase in polar bears all up until this last year, when the ice was close to shore, and then we saw zero. So it's… we thought we had a clear pattern, and then you get too much data and everything becomes a mystery again. But basically, more polar bears are coming into shore sooner, and we're seeing them on the survey.

This is a couple of the folks working with us: this is Heather and Luke, and the remarkable thing in this picture is that they're smiling, because what they've just done here was float ashore through the Canning River Delta on an upside-down boat that Steve was driving and flipped over in some high wind and waves. And this is, to me, a testimony of the kind of commitment and endurance and enthusiasm that these folks have, that they're still smiling after this. And they spent the next few days hunkered down on the Barrier Island. This is the tent that they were staying in, and Steve woke up one morning to see a polar bear paw exploratorily pressing in at him through the tent and leaving a little tear. After lots of screaming and yelling, the bear decided to move on and leave them alone, but you can imagine what that felt like, after floating ashore and having all your clothes be wet. But they eventually got organized and back together, and it was great for telling stories around the cook stove. This is Steve explaining the bear leaning into the tent, and Roger likes to say the most miserable, most memorable, and I'm sure these folks will never forget that trip.

We did have to finish the survey still, so Dave Sowards came out; we convinced him to put an engine in his plane, and we flew it out to the Canning River Delta, landed here, where the accident had been, and put everything back together, collected all the gear, and started up to do the survey again.

The very first day we started, we were coming back in the Canning River Delta and saw this little group of caribou standing there. We were kind of drifting into shore watching them when this grizzly came along, and we weren't quite sure; we thought maybe he was interested in the caribou, but he decided he was more interested in us, and he came right up to where we were and stood up and started looking. After this, I don't have any pictures because he charged the boat, and it was the most remarkable thing I've ever seen: three men standing in a boat with an outboard engine running, and this bear thought we were fair game, so he came after us. We quickly got the boat off the river bar and started off down the river; he ran back to shore and ran faster than our top speed in our motorboat, got ahead of us, and swam out at us again, at which point we resorted to cracker shells. He was only willing to stop swimming after us when we shot a cracker shell in front of him, and then he went back and sort of reluctantly decided to leave us alone. But it was quite a week there, between the boat being upside down, the polar bear, and this guy, and we did finally get back to doing the work that we were there to do and surveyed the Canning River Delta.

Along the way you find large numbers of these birds, mostly juveniles. They're out in the shallow areas trying to double their body weight, get ready for that remarkable migration.

This is just a little clip that we took on a really nice, quiet day, and I just stuck this in to let you know that we are careful about what we do in the boats, and we only travel on really good weather days when it's very calm and level like this. But after six hours of that, you can really notice that you're a little bit shorter than you used to be; so it's never an easy place to get to.

As we were coming home on that last trip, we discovered our boat was sinking, which is not a good thing when you're in a rubber boat in the Arctic Ocean, but it had just worn out. We calculated later it had gone over 3,000 miles up and down the coast at this point, and so it had taken a lot of beating. So, we dragged it into shore, and Heather and Luke here are patching it with rubber cement, and we eventually got it all put back together and headed off for Canada, and we actually got the boat through.

We ended up on some of the really large river deltas, like here at the Jago, finding really large numbers of birds and seeing some lovely sites of staging bids getting ready for their migration, like these Stilt Sandpipers.

That is a really plump Pectoral Sandpiper! And that's really what it's all about; that bird is ready to migrate. So, he's found his cheeseburgers and he's good to go! That tells you that the habitat there is really exceptional, very few places that that could happen.

So, I'm a scientist, I'll have to show you a graph, and the first thing you'll notice about that graph is it's really hard to see any kind of pattern. Well, it turns out that's basically the take-home message. What you're looking at here is the density of birds—I measured as the number of birds per hectare—and on the bottom here is all the river deltas that we stopped at, some of them broken into sections where there are different outposts, and the numbers there are the densities that we recorded in each of those years; we're still working on the 2010 data. But for each of those years, you get very different numbers of birds. I was talking with Fran Mauer about this earlier, that the real remarkable story here is the variability itself. So, here we are in the Jago on the western section; it had the highest density ever recorded on the coast of the Arctic Refuge, but it also had one of the lowest densities in a different year of the study.

So, we're finding that the birds are responding very opportunistically to changes in water levels and food abundance, and across the area, the take-home message really is that any one of those river deltas can be important to shorebirds trying to find that food supply in any particular year, depending on the conditions at that very site. So, whereas you might expect that some sites are always great and others are not so good, in fact, there's a lot of variability year to year, and most sites are important in most years. There are larger numbers of birds at the larger river deltas, and this is part of what Matt Nolan was talking about earlier; John Hobbie said that runoff of sediments is really bad for lakes, but it turns out it's really good for shorebirds along the coast. Those large deltas, which are a result of all that material coming down, are a lot of area, and across that area some of them also have high densities, but they turn out to be really important for staging shorebirds.

So, we finally made it to the edge of the survey, and along the way we got to see some caribou. I want to show you a little vignette about caribou and their migration. These are some caribou out on the Jago River Delta looking at some Semipalmated Sandpipers, and they weren't very impressed, so they headed off on their migration.

We talk a lot about how remarkable the caribou migration is, that they are several hundred miles. But pause just a minute and think about that bird; that bird weighs as much as a double-A battery, and it's going to fly to South America now. That's a remarkable migration that I think should just leave us in awe. And when we walk around on the Arctic Refuge and see these little birds trying to survive out there and think about what they're going to do next, it's truly remarkable. You can feel pretty lonely standing out there on the coastline, trying to understand what these birds are doing when they move twenty times faster than us and always get to the next place quicker than us. And it's a difficult story to understand.

We decided that the next approach we ought to take would be linking together a large number of study sites across the Arctic to try to get a really big picture of the scale that the birds really use of the landscape, of what's going on in their lifestyle. So, we put together a partnership that's coordinate by Fish and Wildlife Service and Kansas State and myself and Manomet, and it's called the Arctic Shorebird Demographics Network. It's the first time that anyone's ever tried to answer the question, "What limits the populations of these species? At what point in their lifecycle are their populations being controlled?" If we can answer that question, we can direct our conservation action at the right place and the right time to solve the problem that's keeping their populations low. So, that's the goal, and carrying it out is a really daunting task.

The sites you see here in yellow are the ones that were in operation last year; we did a pilot season last year in all those nine places. The other ones in blue are sites we're trying to add for next year. All those sites have agreed to participate in a series of protocols that we developed as a group that are standardized across all the sites, where they're looking at how many shorebird nests happen, how many chicks are hatched. Then we're banding those birds, and this year we'll start looking at how many return so we can look at adult survivorship as a measure of what's happening to them when they're outside of the Arctic. We're going to be doing this over the next five years, assuming that we can put the funding together each year. It's a daunting task to try to put one project in the field, so we thought, well, why not try to do 13?

This is our first pilot year on the Canning, and we're unloading here on a lovely quiet day with gusts of 40 miles an hour. When Dirk came in with the Beaver, you know, they can fly at about 40 miles an hour, so it was trying to take off as we were trying to unload it. A really cold day, but we got set up on the Canning River and started our work there.

We're catching birds to band them; we use a very small net, and we catch and handle them very quickly; it has very little impact on their survivorship, but it allows us to learn a great deal about what to do for their conservation. We're banding them with colored bands; this Dunlin will go to China or Japan, and we've already gotten reports back from collaborators there of birds that have been seen in Japan.

We have a wonderful crew, and I mentioned I'd introduce you to a few of them; this is Heather and Chelsea, and you can't quite see Eddie there, so I put in another picture of Eddie in a minute. But Heather and Chelsea and Eddie all worked with us at this site at the Canning last year, and they're all here thanks to the generosity of the Fish and Wildlife Service, to bring them here to the event. I

hope that you'll get a chance to say hello to them if you haven't already. Eddie's an ANSEP student, that acronym is the Alaska Native Science and Engineering Program. We're really delighted to have such great and motivated kids. As we were listening to stories earlier today, I was thinking about George's walk where he just set out from camp and hiked away. This year, the three of them decided they were going to go on a hike, and, when they came back, told us they had walked to Flaxman Island. Now, think about that for a minute; Flaxman Island is, in fact, an island, and it is, in fact, offshore, and it is, in fact, in the ocean. It was still frozen enough that they did that safely, and the grownups probably would have told them not to do that, but their enthusiasm for seeing what was over the next hill or around the next corner took them safely out there and back. And that's the kind of enthusiasm they bring to the work they're doing up there.

So, as we close, thinking about what's going on with those birds in the Arctic, I want to tell you very briefly about one of the threats that's facing the very same birds outside of the Arctic, and that's the Deepwater Horizon. You know, you've heard a lot in the news about what's going on with the oil spill. Manomet agreed to coordinate a survey of shorebirds across the entire Gulf. We have 77 people down there engaged in conducting shorebird surveys to try to figure out impacts on these birds as they migrate through the area; it's an enormous effort. We used some of our data from the International Shorebird Survey to figure out important sites, and each one of these is an important site based on these ISS numbers. The ones that are in red have a lot of oil, and yellow, some. We organized our survey based on those data, and we were able to put people in the field.

As an NGO, we can move really quickly; we hired 14 people on the actual day, Labor Day, and we had hired 77 people within a week and mobilized them to the Gulf. But imagine trying to train that many people, or think about where they're going each day, or how to get them paid, and you can imagine what sort of logistics we've been dealing with.

I can't show you any of the photos or data from our survey because it's part of the NRDA data collection process, but I can show you some public domain pictures of things like this, where you get a lot of oil collecting on inlets, which are, coincidentally, one of the most important places for foraging shorebirds because of the richness of the intertidal mudflats right there. So, that's a big problem. There were some areas where there was a lot of oil that came onshore in places used by a lot of shorebirds, like here in Grand Isle, and offshore we've got these large slicks that are coming onshore.

About the middle of summer, you stopped hearing about this stuff. You've probably seen pictures like this; we're a society that responds to dramatic and intense things, and so these pictures got on the news, and you've probably seen them. What you're not seeing on the news is pictures like this: these are Wilson's Plovers, endemic shorebirds of that area that breed in winters there, and these birds are impacted by oil. They're not really hugely dramatic, and they're not dripping with oil, but birds preen themselves, they collect that toxic material. It can severely impact their kidney and liver function. So, these are serious impacts to those birds that take longer and aren't so dramatic, but need to be monitored. So, that's what we're working on out there right now.

This is a Sanderling, this is the same bird enlarged up here, and Sanderlings are supposed to look like this, but we're finding birds looking like that. And that's not a good thing for those birds.

The same birds that we were talking about earlier that nest in the Arctic Refuge, like the Semipalmated Sandpipers, come through this same area in the spring, and then some of these other birds at different times of year.

So, this is a significant impact to the same birds we're trying to conserve in the Arctic, and that's why we felt like it was really important to get down there and do everything we could. We're now working on the process of trying to figure out how to do remediation work to recover populations of those birds based on the impacts that they've suffered. And what we really need to do is get them back to this condition: this is a Red-necked Phalarope flying off somewhere to the Southern Ocean, clean and healthy and ready to go.

Along the way, it's really important to reach out to the public, and I just wanted to mention that the title of my talk was Avian Conservation in the Arctic. I really just talked about shorebirds, which is what I work on, but if you're interested in other birds in the Arctic Refuge, I'd refer you to *Arctic Wings*; it's a wonderful book that was put together. A couple of the authors are in the room—Fran Mauer and Sarah James are both here—and the collection of essays is really remarkable by each different group of birds and different perspectives on birds. So, if you're interested in learning more, take a look at the book; it makes an effort to try to link together some of the migrations we've talked about, like Terns all the way to Antarctica and Northern Africa.

I'm going to wrap up there and just acknowledge some of the many people who helped us put together all this work, including our partners at Fish and Wildlife Service, and the many field biologists who worked with us on the project, and some of our major funders.

Mark Terry: "The Polar Explorer: How a Film Represented the Polar Regions at 'Conference of the Parties 16'"

Polar Explorer Mark Terry.

Hello everybody, it's so nice to be back here again. It was just a few months; it's hard to believe that I was here for the film festival, and here I am again.

The film you're about to see this afternoon is actually a special edit; it's a unique version that was cut specifically for the climate change conference in Cancun. The reason you're going to see it is this is the very first public performance of it, so no one else has ever seen this before outside of delegates and negotiators down in Cancun.

The reason this was made was because the United Nations had heard that we were crossing the Northwest Passage to study climate change as recent as October last year. We were taking with us the "All-Star Team" of Polar scientists from around the world; we had them from Norway, North America, of course, Belgium, France, everywhere. And we were doing very specific studies to find out how climate change was affecting not just the area in the Arctic, but also the system there as well.

We found some pretty amazing things; a lot of the ice extent has disappeared, as you know, and that has allowed us unique passage to areas that were previously inaccessible. And so, doing experiments and research at those stations, often for the very first time, is the true essence of polar exploration. We brought that data down to Cancun and presented it to all the various delegates and negotiators there.

Now, I'm not going to tell you how it turned out, because after the film I'll let you know, okay.

But what you're going to see now is about 40 minutes. And remember this is not the actual film; the actual film we're still cutting, and we're still working hard to meet a deadline because we've been invited by Washington to show it at the Canadian Embassy on March the 15th. So, as soon as I'm finished here, I'm running back home to the edit suite.

Okay, so in the meantime, enjoy the film, and we'll chat later, thanks.

[Film]

Thank you, thank you very much. I know we don't have time for questions, we'll do that outside, but I just wanted to give you the punch line to presenting this film in Cancun. We convinced a lot of the negotiators to bring what we were calling for, recognition of the rising sea levels to the table. We were really hoping to get a resolution passed.

And I'm proud to say, (that's us, by the way, in the Arctic, obviously) here it is, the system actually works, it says, this is the Enhanced Action on Adaptation Section 2, Section 25/Subsection 25. "The Conference of Parties (COP) recognizes the need to strengthen international cooperation and expertise to understand and reduce loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather events and slow onset events, including sea level rise, glacier retreat and related impacts."

So, there we go.

Okay, if you want to talk more about that I'll be outside. Thank you.

Kenneth Brower: "Arctic National Wildlife Refuge and the Geography of Hope"

I sort of wanted to channel my father in this and represent him a little because, well, because he was the guy they sent to the Brooks Range in '67 to do a book for the Sierra Club then, and also because we've been spending a lot of time thinking about the forefathers and/or the foremothers of this Refuge, and my father was one of these elders who made it happen.

He was charismatic and evangelical, and the environmental movement for him was really a religion. Jimmy Carter referred to his religious feeling; you can absolutely make a fine religion out of environmentalism.

It was the religion that we grew up with in our house; we didn't have the normal kind of religion; that was our religion. What you do is you just go down the abstractional ladder a little bit; instead of God, you're worshiping creation, which is what happened in our family. My father even used the expression, "He's got the religion" or "She's got the religion" to describe someone who gets it. Ed's dad, Zahnie, Howard Zahniser, got it. He was one of the people early on who sort of understood the religion. Not everybody gets this religion; it's not automatic.

But my dad was the first executive director of the Sierra Club, and went on to found Friends of the Earth, which is now in 60 countries, and then Earth Island Institute and the League of Conservation Voters. He established a lot of outfits.

He was a guy who was really consumed by this idea and by this movement. He ate it and slept it, he brought it home to the dinner table; you couldn't have a normal conservation at our family table; he would hijack it. If you came home with a nice bit of poetry from Carlisle or Dunn or something you learned in school, he would co-opt it, figure a way to turn it into the environmental theme.

I think more than anyone, he's the guy who picked up this Muir quote; you know, "when you try to pick out anything by itself, you find it hitched to everything in the universe." In our books that my father and I did at the Sierra Club in the '60s, we featured that quote, and it's such a great quote, it's true. And my father certainly saw that. Everything for him was hooked into this idea of our job in protecting the creation and the beauty of the world.

And he was a very persuasive person. He would draft anybody, everyone he saw, into this movement. It was very hard to resist his influence. He was a very persuasive guy.

And he drafted me. I'd just finished my freshmen year at Berkeley and I did very well my first year. He said, "Would you do a book for me?" There'd been a poet that he tried to get to edit a book on the Big Sur Coast, and the poet hadn't really gotten the idea, so he asked if I could take a try at it. So, I took a semester off and I found I could do it; I could put words with pictures. I lived at Ansel Adams' house for a while. He and my father had started this exhibit format series; they sort of invented the genre of the large-format nature book. It didn't exist before "This is the American Earth," which is the book he and my father and Nancy Newhall put together.

So, I went down and I made the book, and then I got back to start my sophomore year at Berkeley. And I did half of a sophomore year and he said, "Would you go down to the Galapagos and do a book for me?" So, my choice was four months in the Galapagos with Elliot Porter doing a picture book, or finishing my sophomore year at Berkeley. It was no decision. That was '66, and in '67 I went to Maui to do a book for him, and then he sent me to the Brooks Range. And I haven't ever been back; I'm a sophomore dropout, like my father: we both dropped out after three semesters. But there was another kind of education in what we did.

So, we wound up on Last Lake on the Sheenjek, partly because of the Muries' influence. It strikes me, as I think about the last three days, how much… If there's an epicenter for this conference, it's Last Lake on the Sheenjek. So many of our paths have intersected there, like Dr. Bob and Dr. Schaller and Roger and all these folks. There're more pictures of Last Lake, I think, than anyplace. So, I think it must be kind of a power spot.

We got flown in, and Ave Thayer dropped in on us, and he surveyed the route ahead because we had some alternate routes we thought we might go. As he pointed out to me in this meeting, a couple of our routes weren't going to be very good. If adventure was essentially about the unknown, we would have gotten a little more unknown than we wanted.

We had another alternative plan; the idea was to walk across the range and get out to Kaktovik, but if that failed, there was a… I forget where it was, but it was to the west on the south slope. It was a lake where, if we didn't make it, we were going to go get picked up. Well, this year was the flood in the "Shena," and we found out later that we wouldn't have gotten picked up. In fact, it's lucky that we, it's lucky we got all the way out because we would have over wintered on the south slope and that would have been more adventure than we wanted to, I think.

So, at Last Lake we found, it was exciting for me, we found… There was a cache there, it was on poles and it was full of… I climbed up the thing, and there was an old rusty lever action rifle and some traps, and there was a draft card. And it was Ambrose William, who Mardy Murie wrote about. It was exciting for me because there was this little resonance of the history of the place.

From when we left that cache, over five weeks of walking north across the Brooks Range, we saw not a single sign of man. We saw not a cigarette butt, not a blaze on a tree, not a, not somebody's dropped quarter, not anything for all that time; as Dr. Schaller said earlier, "Endless mountains this way, endless mountains that way." There aren't that many places that you can do this.

So, this was the wilderness. One of the nice things about growing up in my family is we got introduced to both the actual wilderness, the place, and the idea of the wilderness, because this was something my father was always working on. Wilderness for him was sort of the dynamo; his first interest in the out-of-doors and in environment and conservation was wilderness preservation, and later, because of this "Muir Axiom" about everything being connected, he saw; it grew. So, before he was finished he became interested in population and in oil and in internal combustion engines and the SST, in global considerations, which the Sierra Club didn't like; in fact, that's one of the reasons he got kicked out.

My father's pattern was to get kicked out of organizations after every 16 years. He built the Sierra Club into one of the most formidable environmental organizations, and they kicked him out after 16 years for being kind of too radical; the same thing happened at Friends of the Earth. He was always a little ahead of the curve. But always, for him, the locomotive for the thing that drove him was his love of wilderness at the heart.

He was one of the best climbers of his generation. He was one of these guys who came down from the mountains and did something with it; there are a number of these people who… The decade of his 20s he was a climbing bum, and then he came down and he did something with it.

And so, we got indoctrinated with the idea of the wilderness, and we've talked about it some here, but one of my dad's definitions was, "Wilderness is where the hand of man has not set foot." I've always loved it because it's goofy, and it's a funny one, but he sort of got it right.

On the surface, there are problems with it that have been pointed out in recent years. Except for the Antarctic, there is no wilderness where people haven't been; there are people in all these places. Over the course of this meeting, I've been thinking about it a little bit, when people point out this problem that, wait a minute, there're subsistence people in these places; people are part of the wilderness, and it's actually caused practical problems for people like the Masaai, who've been moved around because of this sort of prejudice against people in what we call "wilderness." I think some North Slope people have gotten nervous about it, about what their subsistence rights are going to be if this sort of ethic sinks in too hard.

I think everybody's always tried to adjust the wilderness side of the definition, but it strikes me that the simple solution is to adjust the man side of the definition. And the answer is, there's two kinds of people; there's a Homo Sapiens 1 and 2, and man 1 or human kind 1 is Inupiat here at Kaktovik, or it's Sarah James, or it's… I've done a lot of work in Micronesia, it's the Palaun spear fisherman or the woman in Palau or elsewhere in Micronesia who's working the taro gardens.

It's the Carolinian navigator; I've done a book on traditional celestial navigation in the Caroline Islands, an amazing system where these captains learn, for a 30 year apprenticeship, a star course between every one of their destinations possible in their system. Every group, every pair of islands in their whole system has a star course that you memorize over 30 years through mnemonic songs that this to make you remember these things. You have a star path that you follow; as a star comes up it's good for a while, but then it's too far above the horizon, so you switch to another star. The song gives you the succession of stars, which is your star path.

In the daytime, you maintain your course by reading the swells, by maintaining the angle of your canoe to the swell. You do that not by sight so much as by feel, the special motion. The swells are arriving from four different directions; you have to pick out the eastern. Sometimes, when it's difficult, the captain puts his testicles on the gunnels, because that's his most sensitive seismic equipment, and that lets him feel the motion.

These guys are inertial navigators, international navigation systems in effect. They never sleep; you can tell the axiom as you can tell the good captain by his red eyes, because he's keeping constant track of his position. This man can, after 1,500 miles of voyage, can hit an atoll 500 yards long head on. He has a target expansion technique, so he's reading bird signs.

This is the kind of "Type 1" person that we've always had. I'm thinking of another one, my best Army buddy was a guy named Paul Round, who's an Eskimo—we called them Eskimos then—he was an Eskimo from outside of Kotzebue, in Mulik Creek. He was my bunkmate; for some reason they made the youngest guy in the unit and this Eskimo guy who couldn't really speak, they made us squad leaders, so we had a little room together. He got moody one day; I said, "What's the matter?" And he said, "Well, they're moving into summer camps right now." His people back home were moving to the summer camp. He was in Fort Ord, California. He was talking to the birds out of the window. You, know it's a different kind of sensibility.

The "Type 2" human being is most of us in the room, the product of the industrial revolution, the industrial age, the space age, the atomic age, the digital age, all of these ages we've had all of the sudden. And I think those are the people who have been incompatible with wilderness. So, I want to adjust that side of the equation.

This trip was a wonderful trip; one of the definitions we learned about was an attempt to describe what wilderness is. It's Nancy Newhall, in the first of the exhibit-format books, she had this line: "Wilderness holds answers to questions man has, but we have not learned how to ask." And it's so good; this is the idea that this is where life has gone on; this is the way things work, from the beginning until the last on this planet. There's some trial and error that's happened here, and there's answers for us, not just the scientific answer, I think, but just answers to spiritual questions, what it means to be human.

The emphasis often in this last three days has been on the scientific side, and it's important, but I get a little nervous when I hear laboratory or control, controlled space. Because, as Tom Butler said, "The important thing is the place for itself." We really don't need the science to justify it; some science will help in saving it, but the important thing, I think, is the place for itself.

The other argument my father used to make about wilderness was that civilization really is just a veneer; it's the thinnest of veneers, and here we came from was wilderness, and what we evolve for is wilderness, where essentially all our formation was as hunter-gatherers. We didn't get any of our essential nature from being farmers, or from being factory workers, or any of the things that came later. We were essentially formed in wilderness, so it's our home, and you don't have to scratch much off that veneer to feel at home there again, either.

So, it's important for all these things, but it's important as the place we came from, and I think it's even one of the reasons PowerPoint doesn't work so well sometimes. Because where our narrative came from was the face of an elder man or woman, lit by a campfire, talking to us, and I think that's what we're hardwired to listen to.

I think often, when we have the same thing up here in print and somebody speaking, it doesn't work. Sometimes it works, but so often it doesn't work, because I don't think we've had time enough to adjust to this multitasking way of looking at things. You know, this recent study showed that the people who think they multitask best actually do it worst. It's an awfully long time that we've been listening to that, that… Our narrative has come from that face we're looking at.

And I think maybe it'll take 800,000 years of fooling around with our little toys, and maybe we will be able to multitask; we'll be able to get a clear signal from several things at once. But I think it's in the future. I also think it's the fact that it's a veneer, it's sort of the argument old-style field naturalist, sort of "Type 1" human field naturalist.

My mother was the editor at the UC Press, and my parents met as editors, and we learned a lot about good language; that was what our family was about. We got corrected if our grammar was wrong. One of the things my mom would do as she was the editor at the UC Press, and later as an editor at the Anthro Department at Berkeley, was she would bring home this awful jargon that scientists write, and all the kids, we would laugh at it. By the time we were seven or eight, we'd say, "Oh this is a good one!" You know, because of the awful things that happened to language.

One time she brought home a piece, and I started to read it, all ready to laugh at it; it was about a scientist. He was observing a gorilla named Junior; he had named the gorilla Junior, and it was just straight observation describing what this animal did, and within a paragraph or two you could see this animal. This was 50-something years ago, but I can still remember Junior and the plants he ate, and it was just good, straight observation. It was by George Schaller when he was a young man. He's an old style-field naturalist, a "Type 1" sort of human being, who just watches this animal. And how much you learn that way.

I can think of another example; it's Carl Koford, who was "Mr. Condor." He was one of the leaders of the fight to stop bringing wild condors, when there were only 21 left, into captivity, to put collars on them and captive breed them. And he was the scientist on this animal because he watched it; he sat in a little sandstone cave, eating, you know, bread, like John Muir or something, for weeks at a time, smelled bad, then came back and reported this stuff.

And if you read the opening page of "The California Condor," which was his book, and within a paragraph or two you see this animal. I'm a literary person, so it's important to me, but within a paragraph or two you're in the skin of this animal. This is a bird with heavy wing loading; after he's had a big meal on a carcass, sometimes his wings are so heavy, you almost mistake it for a plane because their wings are so steady. But this crashing takeoff, sometimes it's hell for them to get off the ground.

Bob Krear

Sheenjek Expedition, 1956. Long shot of camp on Last Lake.

He describes this stuff, and you can see it, and I compare often with the guys on the other side who clearly wanted to put a collar on everything, be able to sit in a room and watch where this was on a screen. And I do think there's room for more of the old style, and I know some guys are still doing it, but I think we need to go back to a little more of that, especially in a place like the Refuge where I think we have to be careful that we do restrain science.

As I look at the stuff I've seen the last three days, the thing that maybe most threatens the wilderness idea here is maybe hands-on science. I think I've seen too many pictures of animals knocked down and radio collared. I think there are better ways to get some of this information, especially in a place like this, where wilderness and hands-off is sort of the basic message.

Some of the other lines on wilderness that we learned from father: one was Gerard Piel, who was president of the AAAS. And he said, sort of apropos in this business of a veneer and where wilderness is tested and true, where it's been going on since the beginning of life according to natural processes, he says, "Without wilderness, in a deeply terrifying sense, man is on his own." And I think that's a great thought, because if all we have is manipulated stuff and how we do it, I think that is scary and deeply terrifying. If there are no places like this refuge where you can go and look at how it's done the original way, it is terrifying; we are on our own, and it's scary.

This trip of ours, we started with way too much weight. I was carrying more than 100 pounds at the beginning. Because we were going to be out for five weeks, we didn't want to hunt. But I was a horseback, I was 22, I was like one of those dumb oxen that you have to be careful you don't grease the wheels so they don't pull themselves to death. I loved the weight at first, you know.

It was both extremely beautiful, and—other people have said this—it's also miserable sometimes. And there's the line about misery and memory, you know. Walking tussock grass with a lot of weight, oh my god, trying to find the balance between stepping on top of the tussock and stepping in the hole between; there're stretches of the Brooks Range where it seems like there's no alternate, either the braided bars where you're entering and leaving the water all the time or walking on tussocks.

And I was talking with Sarah. God, wouldn't it have been great if Sarah James, this was the period… We're at the same age, I'm a year younger than Sarah James, and she… And this was not too long after she was sliding in her new parka. Wouldn't it have been great if I'd met Sarah James there? I might not have ever gotten out of the Brooks Range. We were talking about when you pull your boot out of the hole between the tussocks, you have to either pick the hole or the top of the tussocks, which tips you off. Your boot is pulling out, your foot is pulling out, and the mud is trying to hold your boot down. So, we both pointed to the same patch, everybody knows this experience, I guess, the same patch in our heel that gets warn raw as your boot does this.

So, there is a misery component, and it's such big country; sometimes I actually have the fantasy that somehow I made a wrong turn and I was on a planet with a longer contour interval. The country is so big, it was like a longer contour interval… And, of course, I was on a different planet.

There's a thing that happens when you're in a big landscape like that day after day. There's this paradox of, here you are in this huge landscape, which, on the one hand, turns you outward to it, but on the other hand, it turns you in on yourself with such force. I think it's because the noise is so reduced that the signal of yourself is amplified. And the things that happen in your imagination; I'm sure it's this way with everybody. The things that happen in your imagination, walking across a big landscape like that, where you're both turned outward and inward; amazing, amazing things happen inside your head because the noise has been reduced.

The only side of man we saw were these contrails of jets going over, and I began to think that these were Strategic Air Command bombers finishing up the last world war. We hadn't seen anybody for weeks; I became almost convinced that this must have happened, because why were these planes going over every day? It was one of the kind of goofy things your mind had been led to… I sort of wrote a science fiction novel about a post-apocalyptic novel in my head.

I just think this is one of the things that wilderness gives us; it's a vision quest kind of a thing. You don't need hallucinogens, you know, you walk across a big landscape like this because of the way it powers your imagination.

It was an incredible trip. One of us wouldn't wash dishes because he was navigating; there were three of us, and he said he had to read the map every night. Steve and I, the other guy, still talk about that, 45 years later, when we get together; he said, "Do you remember John never washed the dishes?" And it still pisses us off. So, remember to wash the dishes when you're in a camp situation.

We came finally down to Barter Island and we really planned the trip perfectly until we hit the channel that separates the land from the island. We'd assumed we'd be able to call the attention to the people in the Distant Early Warning Line Station that was then operating there, so we'd get a ride across. But the station was a little far off, so we fired the gun, and nobody came. And one of us, Steve, was about to… He didn't want to do it, but he was actually in the water, about to go across on his air mattress, which would have been a miserable trip, on his chest, but guy who was there hunting with his daughter came in a boat, and we got a ride across.

I had dropped about 15 pounds, and this DEW Line Station that was operating then was like a little space station on the North Slope. They had wonderful food because they wanted to attract the people there. Every busboy there had a direct line to a stockbroker; it was like the pipeline before the pipeline. And they ate very well, and I ate all night long, I just kept eating. I realized people were watching me. I started drinking a lot of these cocoas and they said, "Oh you shouldn't do that, that'll make you loose." And I just said, "Huh?" To show off, I drank and I ate all night long, replacing that weight.

Everybody seemed a little crazy there; it's not so good to be in the wilderness if you're in the wilderness but also confined in a little space station. One of these busboys had written a… He'd been a mental health worker, and there was a case where there was some abusive treatment of one of the patients, but he knew this guy because he'd been an orderly himself; he knew the pressures that had gone under the slightly abusive treatment that had injured the patient. So, he sat for months at a time trying to explain the nuances of this situation in his deposition that he'd been asked to do, and it was a long piece; it was just incredible. He'd poured so much into it. This is the Arctic; this is cabin fever in the sort of DEW Line Station version.

We were finally washing our clothes and some officer came in and we weren't supposed to be there; we were violating a security clearance. And he said, "You can't be here." So they ran us out; the "Type 2" human beings ran us out and we moved in with the "Type 1" human beings at Kaktovik and got taken in.

So anyway, that's my story.

Closing Thoughts—Greg Siekaniec:

Maybe I can take just a few minutes and talk about more of my perspective from having left a lot of years working on National Wildlife Refuges, working for conservation at a different level of the organization. And perhaps, getting into Washington, now having been there for two years, where you really suddenly realize that, man, you really are a bureaucrat! I mean, you're one when you're in the field, but, boy, when you get into Washington, D.C., it clubs you over the head.

Arctic Refuge is almost like that dichotomy of extremes in so many ways. You all know it, you've heard of it so much already for the last three days. It's often described as the most god-forsaken and desolate and barren place in the world, with pictures of frozen coastal plain, blowing snow, and it's coupled with attitudes of "What would it really matter that development encompasses a few of those 19 million acres?" But then you turn that around and you contrast that with a biologically diverse assemblage of flora and fauna, home to the internationally important Porcupine caribou herd. It's bathed in glorious daylight for 24 hours a day, and it's an adventurer's heaven, and is sacred ground in many ways; it's the ancestral ground of the Gwich'in Nation.

The name Arctic National Wildlife Refuge can evoke a sense of place. It's a wilderness ideal, it boasts of humility and restraint; a land of wildlife, a place of scientific discovery. Take the time to turn that Arctic National Wildlife Refuge into the acronym of ANWR and it also evokes a sense of place, and it actually evokes a sense of discovery in some. But to many it invokes a sense of disdain, mistrust, and inference to the unenlightened, and you may be treated as though you have sullied 30,000 acres of wild earth; extremes, no doubt.

Brad, you noted earlier that language really has power.

The debate over whether there should be a monument, I think, has been really interesting since moving into Washington, with a new administration. I think it has brought about sort of the same sense of extremes, even among ourselves in the Service and the Department of Interior, and amongst our conservation friends. The argument goes in many, many directions. Monument designation provides no added protections? Perhaps. The monument will highlight the significance of an incredible national treasure and make legislators perhaps think twice. A monument designation will prevent further wilderness consideration? Maybe. A monument designation in a unilateral action by the administration will prevent or will incense congress, and we'll pay for it in budget retaliation? Yes, perhaps. But our conservation friends need a win for their years of effort, and what perhaps spoke loudest to me is that you could forever lose the name Arctic National Wildlife Refuge in place of Arctic National Monument. And some others followed that with, at least the acronym ANWR would go away. Or perhaps that sounds like a park, and others quipped, maybe it should be a park. It denotes the extremes of consideration.

But to me, if there's one place that we have constructed as an iconic name that has perhaps become a symbol of America's wilderness and wildlife refuges, this is the place. In my humble opinion, the value of this iconic name cannot be overstated.

I didn't realize how much I personally identified with the name of Arctic National Wildlife Refuge until I attended the Wilderness Gala in Washington, D.C. Oh, it was maybe five or six weeks ago, and it was a spectacular event. But upon walking into the museum where it was held, I ran smack into a poster that had a nice photograph of a caribou on it, and emblazoned over the top of it was *Arctic National Monument*. And it was like that show-stopper for me, you know, it's that one that gives you that weird kind of feeling in your stomach like, "Wow, this actually could happen," you could lose that iconic thinking in name and effort and work that has gone into it.

Perhaps it's these extremes of Arctic Refuge that draw the ecologists, scientists, and the adventurer, as well as the policy-maker and the politician, to the debate. Again, as we heard yesterday, the Arctic Refuge is the potent symbol that keeps a national dialogue alive and helps grow a much-needed constituency.

While I was listening yesterday, I was struck, and a lot of the discussion today was really about it: it's the irony of the Arctic Refuge. For more than 50 years, conservationists from all walks of life, who work tirelessly, literally tirelessly, to protect, conserve, preserve, and designate, have held fast to a wilderness ideal, "A little piece of our planet left alone," as I believe Olaus Murie stated; or, as George Sumner noted, "A place with the freedom to continue, unhindered and forever, if we are willing." Yet, the irony of it is that human influence and climate change are having the most profound effect on arctic environments before elsewhere in the world.

So, I ask myself a couple of questions: Will knowing the changing arctic environment is an artifact of human action elsewhere make me or others view Arctic Refuge's trammel? Will it continue unhindered and forever? Fran, your thought on Arctic Refuge remaining wild if we do not intervene is perhaps sage advice. But do we also have the wherewithal to join the rest of the world in saying, "This simply is not acceptable?"

So, as we look to the future, I think there a couple of thoughts that, hopefully these won't seem too mundane or too bureaucratic, but I think they're important for us as an organization, as an agency, and they're probably worth noting. In 1980, I think we were truly given a gift when the Alaska National Interest Lands Conservation Act was passed. As you have heard, it's perhaps not perfect, but I think what it says to me more than anything else is that the nation looked and they said, "Well, what has happened in the rest of our country is not acceptable for Alaska." Very simply, the American people asked us to do something different on their behalf. And I think ANILCA, sorry for the acronym, the Alaska Lands Act gives us the backbone to deliver, on behalf of the American people, a healthier, more intact conservation estate and system of protected areas than what we find throughout the rest of the United States.

It is our responsibility as the biologists, as the scientists, and as the policymakers to wring every drop of conservation out of the Act to ensure that we hold fast to the conservation ideal embodied within both the Act and Arctic National Wildlife Refuge. Arctic National Wildlife Refuge needs to deliver a conservation plan complete with wilderness reviews for the remaining areas in the Refuge not already designated. The Fish and Wildlife Service needs to go on record as to the wilderness character of the refuge, and make recommendation for inclusion in the Wilderness Preservation System. To me, it's that simple; it's time we do it.

We need to remain an active participant in the activities happening not just within the refuge, but proposed around the Refuge and throughout the Arctic as a whole. Our recent effort to think about conservation issues through the Landscape Conservation Cooperative, I believe, can influence common conservation goals across the Arctic. As we are all engaged in planning right now, from the Arctic Refuge to the Gates of the Arctic, to all three of the units of the National Petroleum Reserve Alaska, the Secretary of Interior has a keen idea that, as the Landscape Conservation Cooperative identifies common conservation goals and strategies, they become enveloped within everybody's conservation thinking and planning. I think we can do it, I think we can influence it, and I think it will have far-reaching effects.

Brad Meiklejohn

I think we need to be ever mindful of a simple fact: it was elucidated by Dr. Bengston yesterday that our largest constituency is comprised of a public that does not live nearby and will likely never visit the Refuge, and we should never lose sight of that. This constituency has been our voice, and will need to be loud on our behalf in the future. However, your voice as scientists, as biologists, as policy-makers, is equally important.

I think Edward Abbey had a really sort of nice way of putting it. Edward Abbey is a very staunch writer and wildlands advocate; he always recognized the need for scientists to have one foot firmly planted in the concrete of fact, and the other firmly planted in the shoe of the poet. You need to tell your story; we need for you to tell your story.

I've been fortunate, as Jay was saying, to live in numerous places in Alaska, and I've experienced a number of places: Alaska Maritime Refuge, the Aleutian Islands, sort of working in the shadow of Murie, when he did the '36, '37 visit to the Aleutians, and told us that, "Well, for the last thirty years, you've kind of been doing some things wrong." Thinking that fur farming and sea bird conservation and other things could kind of go hand in hand. And, you know, the restoration work recommended by Murie is still going on today, and to be a part of that was pretty spectacular.

Bob Krear

Sheenjek Expedition, 1956. Mardy Murie and Olaus Murie with packs and hiking gear.

You heard earlier about the Pribilof Islands, and the fur seal issue, and St. Matthew Island, and up on the North Slope, and then at Izembek National Wildlife Refuge and the tremendous flocks of birds.

I've been lucky enough to visit Arctic National Wildlife Refuge on a couple of occasions, on personal trips to take my 15-year-old son there, who… between a 15-year-old son and a daughter, I had a deeply ingrained, now they have a deeply ingrained, passion for wild places. So, Alaska has been tremendously good for me, and it's been good for our family. Now residing in Virginia, it is… I'd be lying if I didn't say that I miss Alaska every day when I sit in a line of traffic that hasn't moved for 20 minutes

But I find myself often kind of daydreaming of that walk on the tundra, the hike through bear country, the time I was with Glenn Elison I think we saw 21 bears as we hiked down with the deputy director for the Fish and Wildlife Service, many of them… closer than some people wanted to be for comfort. Or, you know, I'm walking through that head down into an Aleutian gale. It's spectacular country; I've enjoyed being a part of it.

I think the challenge we have in front of us is, this is our opportunity, let's create a comprehensive conservation plan that lays out a wilderness vision for Arctic National Wildlife Refuge. Let's stay tuned in; let's use our constituencies. You know, they are the people that are not likely to visit the refuge; they are the people that do not live there. Let's stay in touch with them.

I would like to reflect, just for a moment, on Mardy Murie's 1978 "Two in the Far North," where she added a little afterword. She wrote, "When I think about that return to the part of Alaska that has meant so much in my life, the overpowering and magnificent fact is that Lobo Lake is still there, untouched. The tundra, the mountains, unmarked space, the quiet, the land itself, are all still there. Do I dare believe that one of my great-grandchildren may someday journey to the Sheenjek and find the gray wolf trotting across the ice of Lobo Lake?"

So, let's end this look back on 50 years of Arctic, and point ourselves to the future with a resounding, "Yes" to Mardy's query. Yes, we will dedicate ourselves to the tundra and to the mountains of Arctic Refuge. Yes, we will insure that the untouched will remain. Yes, we will give Lobo Lake the wilderness, it's solitude, and it's wildlife to the next generation, for we have no greater gift to give.

Roger Kaye: "Celebrating a Wilderness Legacy"

We will soon celebrate a milestone in American conservation history: the year 2010 is the 50th anniversary of the establishment of a landmark wilderness, and now a symbol of the dilemma we face regarding our effect on the global environment and what quality of it we are to leave future generations—the Arctic National Wildlife Refuge.

It didn't come to us easily. Through the 1950s, powerful economic interests and Alaska's political leaders stridently opposed the proposed 9-million-acre wilderness reserve. But after a hard-fought, seven-year campaign and failed legislative attempts, widespread public support persuaded the Eisenhower administration to establish this "Last Great Wilderness" through an executive order. Its stated purpose was "to preserve unique wildlife, wilderness, and recreational values"—the tangible values for which the Arctic Refuge is renowned today. But beyond perpetuating the wildlife and wildness within its boundaries, there had been another purpose in the minds of those who led the fight.

To understand their underlying motive—and the larger significance of their victory—we need to realize that the Arctic Refuge campaign was rooted in a growing fear for the future. The refuge's establishment was among the first of the sweeping conservation initiatives of the 1960s that came about in response to concern over the worsening environmental degradations accompanying the prosperous post-World War II march of progress. The rapid loss of natural landscapes, the destructive logging, mining, and agricultural practices, the spread of pollution and pesticides, and the awesome power and fallout of the Bomb: these were among the concerns that were awakening many Americans to a new order of environmental threat. Some even questioned whether future generations would inherit the same Earth. Among them were Olaus Murie, director of the Wilderness Society, and his wife Mardy, who together led the long struggle.

This was a team uniquely suited to the challenge. Olaus had grown up in northern Minnesota, hunting and trapping to help support his widowed mother and siblings. These experiences and his early immersion in the turn-of-the-century nature literature led him to become a biologist. In 1920 the U.S. Biological Survey, now the Fish and Wildlife Service, sent him to Alaska to conduct a detailed six-year study of the territory's caribou herds. In 1924 Olaus married a lively Fairbanks girl, Mardy Thomas, the first woman graduate of the University of Alaska. After a brief ceremony on the remote Yukon River, the couple took off on a 550-mile boat and dogsled research honeymoon through the Brooks Range, recounted in Mardy's classic book "Two in the Far North."

During far-flung expeditions throughout Alaska and Canada, Olaus interpreted his keen observations from the combined perspectives of the emerging science of ecology and the transcendental tradition of Henry David Thoreau and John Muir. He came to what he described as "a realization of a kinship with all life on this planet." Olaus's focus became "what I consider human ecology… the importance of nature by which we live—not only physically, but aesthetically and spiritually as well."

In 1956 the Muries led a five-member, summer-long expedition to the heart of the proposed wilderness, the mountain-lined Sheenjek River, the "Valley of Lakes."

They arrived as "humble guests," Mardy said, accepting this landscape's intrinsic purpose, that "it is itself, for itself." Such was "the spirit of the place" in which their scientific exploration of "the whole ecological ensemble" would be conducted and their impressions of it recorded. Their writings established the free-roaming caribou as a symbol of the area's untrammeled natural processes. The wolf came to represent its freedom from human control and subjugation.

But their studies focused on the interrelatedness of all life forms, not just the large, charismatic mammals. Mice and sparrows received their full attention, as did the 23 species of spiders and 40 species of lichens they catalogued. Here was one of the nation's few remaining ecological systems fully intact and large enough for scientific study of how nature functions when left alone. Thus, Olaus argued that it should be kept wild "for our understanding of the natural processes of the universe… which throughout the ages have made this planet habitable."

The Muries also believed the area ought to be left unaltered for the unique recreational opportunities if affords, although "recreation" is a wholly insufficient term for the experiences they wanted to be available here.

This should remain an adventuring ground, they believed, the antithesis of the domesticated and convenience-orientated tourism that national parks were promoting at the time. As a remnant of frontier America, visitors could come to experience the conditions that helped shape our national character. They could explore and discover, experience freedom and self-reliance, and confront challenge, even hardship. "For those who are willing to exert themselves for this experience, there is a great gift to be won," Mardy wrote, "a gift to be had nowadays in very few remaining parts of our plundered planet—the gift of personal satisfaction, the personal well-being purchased by striving."

Within the area's silent vastness, absent the reminders of civilization, the Muries also experienced the gift of true solitude. They found peace, wholeness, and restoration, and through them, transcendent insight. This was also, as Olaus said, "a place to contemplate and try to understand our place in the world."

At the time, Olaus and his partner at the Wilderness Society, Howard Zahniser, were working to enact what would become the Wilderness Act. Beyond the practical benefits of providing for recreation and protecting wildlife, habitat, and scenery, they believed areas set apart as wilderness would serve another increasingly important need. As Zahniser summarized it, "We deeply need the humility to know ourselves as the dependent members of a great community of life." He explained that "To know the wilderness is to know a profound humility, to recognize one's littleness, to sense dependence and interdependence, indebtedness and responsibility."

Thus, when Olaus declared that "We human beings need to muster the wisdom to leave a few places of the earth strictly alone," he meant preserved for reasons beyond the uses and benefits that wilderness areas might provide us. They were also to be left there for themselves, as touchstones to that better part of ourselves that holds reverence for something beyond human utility.

Preservation of this place would be a gesture of humility, an encouraging demonstration of our willingness to accept restraint and limit our effect on the larger community of life. Its establishment would affirm our capacity to rise above the commodity orientation that has come to dominate our relationship with nature—an orientation obscuring our embedded role in the community of life and, ultimately, underlying all our environmental threats.

"This attitude of consideration and respect," Mardy wrote, "is an integral part of an attitude toward life, toward the unspoiled, still-evocative places on our planet."

This Arctic wilderness exemplified the natural qualities the Muries, Zahniser, and others sought to protect in a Wilderness Act. As well, its purpose embodied their larger hope for the wilderness concept—that it might stimulate Americans to think beyond conservation of resources to the protection of whole ecosystems and, beyond that, to rethink their relationship to the larger biosphere we jointly inhabit. It's the reason that, over and over, through their writings and testimonies, the Refuge founders placed their advocacy for this wilderness in the larger context of the globe, the planet, the world, and the earth.

As the Muries intended, the struggle over the future of this distant place did become emblematic of the larger contest between competing views of the appropriate relationship between postwar American society and its rapidly changing environment. But the question their generation resolved has re-emerged to confront ours: Which notion of progress should this again-contested landscape represent? Should it be the idea of progress underlying the prevailing rush toward attaining an ever-higher material standard of living? Or should it represent the emerging biospheric perspective emphasizing sustainability and calling for restraint? Controversy over this area's future began as—and is again—emblematic of "the real problem," as Olaus Murie characterized it, "of what the human species is to do with this earth."

Today, we again face a new order of environmental threat. Increasingly, scientists warn of a non-analog future, a "perfect storm" convergence of global energy and resource scarcity, climate change, and widespread environmental alterations. "The real problem" Olaus spoke to is upon us. And again, the Arctic Refuge serves as a point of reference for rethinking our national conservation policy. It has come to symbolize the question of where we will draw the line on our profligate energy use and unsustainable behavior toward nature. Its inviolate boundary lines continue to serve as heartening affirmations of the boundaries American society is willing to place on its consuming quest for more consumption and an ever-higher standard of living. The Arctic Refuge remains the finest example of the wilderness that serves, in Wallace Stegner's phrase, as "our geography of hope."

And that's the reason millions who will never visit the refuge find satisfaction, inspiration, even hope in just knowing it's there.

As we celebrate the 50th anniversary of the Arctic Refuge, let's remember that it represents the sense of obligation a past generation felt toward the future. Let's remember that we inherited not only this remarkable place, but that same obligation to think beyond our selves—to think of those people and creatures, of the present and future, here and everywhere, with whom we share this conflicted globe.

Dr. George Schaller: "Saving America's Last Great Wilderness"

It was still light at 11 p.m. in northeastern Alaska on June 26, 1956. We had flown in to Last Lake in the upper Sheenjek Valley to establish our camp. The Sheenjek River flows south through the foothills of the Brooks Range; to the north, beyond 9,000-foot peaks, the Arctic Slope extends to the Beaufort Sea. Grey-cheeked thrushes sang and a pair of mew gulls called by the lake as we set up our tents. Restless and inspired by a limestone peak behind camp, I started up toward its summit. One and a half hours later, I had climbed the 2,500 feet to the top. Standing alone on the peak, at the convergence of rock and sky, there was nothing to distract from the beauty around me. Mountains extended to the horizon, those toward the north capped with glaciers and snow. No buildings disrupted the landscape and the only roads were those made by caribou.

Far below among the patchy spruce I could see the white dots of our tents. Olaus Murie, famous naturalist and president of the Wilderness Society, was there with his wife, Mardy, and so were Brina Kessel, an ornithologist from the University of Alaska, and Bob Krear, like myself a graduate student. Sponsored by the New York Zoological Society (now the Wildlife Conservation Society) and the Conservation Foundation, we had come to the Sheenjek valley to study its natural history and to absorb its "precious intangible values," as Olaus phrased it. But our main aim was to gather the kind of information that would ultimately lead to the protection of this, the last great wilderness in the United States. I descended from my mountaintop and returned to camp at 2:30 a.m.

Most people watched in horror as millions of gallons of oil spewed into the Gulf of Mexico this spring and summer, oiling birds, contaminating marine life, and threatening nesting turtles. But Sarah Palin posted on her Twitter page: "Extreme Greenies: see now why we push 'drill, baby, drill' of known reserves & promising finds in safe onshore places like ANWR [the Arctic National Wildlife Refuge]? Now do you get it?"

Unfortunately, she was not alone. Though it seems illogical, in the wake of the BP Deepwater Horizon disaster, some in Congress have renewed their cries for drilling in the Arctic Refuge. The tragedy in the Gulf should have been a wake-up call for the nation to move away from oil and toward renewable energy sources and fuel efficiency. Instead, these politicians are seeking to expose the last great wilderness in the country to oil drilling and the pollution and industrialization that come with it.

Defenders of Wildlife has been fighting to safeguard the Arctic National Wildlife Refuge from these and other threats for decades, and clearly the battle is not over. We are currently working with other groups to pass a bill in Congress to protect the coastal plain of the Arctic refuge from the "drill everywhere" mentality by declaring the plain a wilderness area.

A progression of perfect days followed as we hiked, observed, took notes, and shared what we had seen. Brina concentrated on birds and, by summer's end, had tallied 85 species, among them gyrfalcon, red-throated loon, and golden plover. Bob was excellent at fly fishing, and supplied me with grayling to measure and age, and camp with delicious meals. Olaus taught me to identify the contents of grizzly scats—mainly grasses and roots—and of wolf scats with the hair of caribou and ground squirrel. "Gee, this is wonderful," he would say, pulling apart a scat, and showing that one must not just glance at something but look deeply into it.

I collected a sample of everything I could pluck or grab, delighted with the variety of plants and animals around me. My plant press ultimately held 138 kinds of flowering plants—delphinium, lupine, anemone, buttercup, and rhododendron, to name just a few—and 40 kinds of lichens. My alcohol-filled vials preserved 23 spider species and many insects, including three kinds of mosquito that had come to inspect me. I trapped mice and lemmings for the University of Alaska museum. Several Gwich'in came from Arctic Village, 40 miles away, to visit our camp, among them Margaret Sam. When 50 years later we had lunch again, her main memory was of me sitting at the camp table skinning mice and stuffing the skins with cotton.

We all admired the Muries for their curiosity and responsive heart to everything around them. By word and example they stressed that conservation depends on science but that, just as important, it is a moral issue—of beauty, of ethics, and of respect and compassion toward all living beings. Their wisdom has remained with me always.

Olaus urged me to explore the country, which I did by wandering off alone for a week to the headwaters of the Sheenjek. There at the crest of the Brooks Range, close to glaciers, was a band of a dozen magnificent dall sheep rams. I photographed the glaciers, not realizing that some day these scenes would help document the impact of climate change. To the north was the coastal plain where

polar bears den and 180,000 caribou of the Porcupine herd gather on the greening tundra to have their young. That area is the biological heart of the region, one the Gwich'in have named "the sacred place where life begins." Snow fell as I descended into the valley of the East Fork of the Chandalar and from there back east to the Sheenjek.

I was asleep on a river bar when, at 5 a.m. grunts, churning gravel, and rushing water startled me awake. A herd of caribou flowed down the shadowed valley toward me. I lay still as wave after wave of animals poured past me, some within 60 feet. In early June many caribou had traversed the Sheenjek on their way to the Arctic slope to calve. Now, on July 16, they were back, a wild river of life. The Porcupine herd defines this Arctic ecosystem with its migrations, and is a symbol of this wilderness.

Like the earliest bird migrants, we left the Sheenjek in early August. We had marveled at the remarkable diversity of life, and now had to fight for its protection. Olaus and the Wilderness Society initiated a campaign to safeguard northeastern Alaska, and they were joined by many Alaskans. A few years earlier, in 1952, I had seen the first tentative oil development on the Arctic Slope just west of Prudhoe Bay. With vague concern I wrote Secretary of Interior Fred Seaton on November 25, 1957, that unless the area is protected it "may well in future years resemble one of the former Texas oil fields."

On December 6, 1960, Seaton issued the order establishing the Arctic National Wildlife Range, 14,000 square miles in size. We were jubilant. At that time I was still idealistic and naïve, assuming that any protected area is safe from exploitation. But with the discovery of oil at Prudhoe Bay in 1968 and the completion of an 800-mile oil pipeline south to the coast in 1977, the tranquil Arctic range became the center of one of the great conservation battles of the century, not only over land but also over the fundamental values of American society.

In 1980, President Carter doubled the size of the Arctic range to 31,000 square miles, an area almost as large as Maine, and it was renamed the Arctic National Wildlife Refuge. It was designated as a wilderness—except that 2,300 square miles of the coastal plain, named Area 1002, were excluded by Congress, pending review because of potential oil.

My disquiet of the late 1950s hardened into certainty that politics, greed, and lack of social responsibility would destroy this unique corner of our planet unless prevented from doing so. Beginning in 1987 British Petroleum and other oil companies lobbied hard for drilling rights in the Arctic refuge. George H.W. Bush made drilling there the centerpiece of his energy policy. Never mind that no one knew how much oil was beneath the refuge. The best estimate was 3.2 billion barrels, a mere 200 days of U.S. consumption. Oil conservation through raising vehicle mileage standards and by funding development of alternative energy sources was not on the agenda. Drilling advocates claimed that drilling in the Arctic Refuge would damage only 2,000 acres—but this didn't include the many roads, gravel pits, pipelines, production facilities, housing and other infrastructure associated with oil extraction.

The battle for Area 1002 continued throughout the 1990s. Some members of Congress targeted the Refuge and toyed with various means of destroying it. A budget resolution in 1995 assumed $1.4 billion in revenue from oil leases, but President Clinton vetoed the entire federal budget because of this provision. The Wilderness Society, Alaska Wilderness League, Defenders of Wildlife, and others urged President Clinton to declare Area 1002 a national monument, but sadly he failed to respond.

When George W. Bush became president in 2001, his administration became essentially a subsidiary of big business and big oil, and in this it was abetted by various members of Congress. A defense authorization bill was introduced that would mandate drilling in Area 1002, and a House committee passed an Energy Security Act with the same provision. Backdoor legislation was attempted by attaching drilling provisions to unrelated bills. The 110th Congress tried this tactic 20 times, and each required an Arctic shootout between House and Senate. Fortunately none passed.

Instead of passing realistic energy conservation laws, the petro-politicians used cynical scare tactics to confuse the public: Lack of Area 1002 oil would increase electricity shortages, raise gasoline prices, slow the economy, and endanger national security at a time of war. The implication is that those who oppose drilling are unpatriotic. On the contrary, patriotism consists of ignoring propaganda and fighting the proponents of plunder and pollution with integrity on behalf of America's future.

Two-thirds of the American public opposes drilling in the Arctic Refuge, including the Gwich'in of Arctic Village. They say simply: "The caribou are not just what we eat, it's who we are." They know that their culture depends on the caribou that calve in Area 1002. The Inupiat at Kaktovik were all for drilling and its financial bounty, until they realized that an oil spill in the Beaufort Sea could ruin their subsistence culture of fishing for arctic char and hunting for bowhead whale. Now over half have reconsidered their position.

Late in 2007, George W. Bush rushed through a plan that would allow Shell Oil Co. to drill offshore near Kaktovik. The drilling would be directional and require no extensive development on land, it was claimed. A federal appeals court halted the plan because of lack of scientific data. Yet in October 2009, Shell received a permit for exploratory drilling in the Beaufort Sea. (Interior Secretary Ken Salazar recently suspended drilling in the Beaufort and Chukchi seas in the aftermath of the BP oil disaster in the Gulf of Mexico.)

That so many of us over the decades have had to fight again and again to preserve the Arctic Refuge, that after half a century it still remains vulnerable, fills me with frustration and indignation. Why should we constantly have to argue about saving a place of such beauty and intrinsic value? Those who condemn the area should have to explain truthfully why it should be sacrificed with such casual arrogance to special interests. The Arctic Refuge retains its ecological integrity and, at a time of rapid climate change, it offers a unique natural laboratory to compare with other northern areas. But this gift of an unspoiled landscape needs no such scientific justification; it must be preserved for its own sake as an icon of America's natural heritage and our role in nature.

When the 50th anniversary of the Murie expedition approached, the Murie Center in Wyoming suggested a visit back to the Arctic refuge. I happily agreed. Jonathan Waterman, an author who has made many journeys through the Refuge, agreed to organize our return in 2006, funded by the National Geographic Society and Patagonia Company. Three graduate students came with us: Martin Robards and Betsy Young from the University of Alaska and Forrest McCarthy from the University of Wyoming. Gary Kofinas, a professor at the University of Alaska, also joined the team.

First we descended the Canning River in rafts from the Brooks Range across the western edge of Area 1002, almost to the Beaufort Sea. There were scattered bands of Porcupine caribou, which now number an estimated 120,000, fewer than in the 1950s. We met a bear, too. There were also many birds we had not seen on the Sheenjek, such as ruddy turnstone and parasitic jaeger. A remarkable total of 180 bird species have so far been recorded in the Arctic refuge. Above all, the tundra still stretched in all directions without building or pipeline: the U.S. Fish and Wildlife Service has taken good care of it. By contrast, that March of 2006 the main pipeline at Prudhoe Bay leaked 270,000 gallons of oil onto the tundra.

Later we flew up the Sheenjek Valley to Last Lake. With relief and delight, I found that little had changed. A pair of mew gulls still claimed the lake. By comparing photographs of our old campsite with the spot today, we found that, although a few of the spindly spruce had died, others survived. McCarthy's task on this trip was to locate places that had been photographed in the past 50 to 100 years and compare these with today. He found that glaciers have retreated and shrubs have invaded areas that were formerly tundra. When we spoke with Gideon James, a Gwich'in elder, about such impacts of climate change, he provided important insights. "Vegetation grows thicker," he said, and caribou don't go to these places now; the ice of lakes is thinner so "people don't go out into the middle no more;" and there are now wildfires on the tundra, unlike the past. And, he noted, a blue bird was for the first time seen at Arctic Village.

Five decades after my first ascent, our whole team climbed the mountain by camp. As we sat on the summit among cushions of yellow-flowered saxifrage, I was elated beyond measure. The Muries' vision for this place—a wilderness that was still pristine and tranquil—was being passed on to a new generation. Robards rightly noted, "How magical to return after 50 years and find things the same."

This year marks the 50th anniversary of the Refuge's establishment—and it is also a year of decision. Only constant vigilance, commitment, and clarity of purpose have prevented this natural treasure from yielding to the forces of destruction. It represents America's compact with wildness and wilderness better than any other place. President Obama must now invoke his powers to declare the coastal plain, Area 1002, a national monument. Or Congress can declare the coastal plain a wilderness area and have President Obama sign this into law.

Mardy Murie spoke for all of us when she wrote: "I hope the United States of America is not so rich that she can let these wildernesses pass by—or so poor she cannot afford to keep them."

Appendix: The Symposium Speaker Bios

Dr. Dave Bengston
David N. Bengston is a research social scientist and ecological economist with the USDA Forest Service's Northern Research Station in St. Paul, Minnesota, and an adjunct professor at the University of Minnesota. He is the coordinator of the Ecological Economics in Forestry Research Group of the International Union of Forestry Research Organizations and was a 2004 Organisation for Economic Co-Operation and Development research fellow at Seoul National University. Dr. Bengston's research focuses on changing environmental attitudes, beliefs, and values; the environmental views and concerns of ethnic minority communities; and strategic foresight applied to environmental planning and policy.

Dr. Douglas Brinkley
Douglas Brinkley is a noted author and a professor of history at Rice University. He previously was a professor of history at Tulane University, where he also served as director of the Theodore Roosevelt Center for American Civilization. Brinkley is the history commentator for CBS News and a contributing editor to Vanity Fair. He joined Rice and its James A. Baker III Institute for Public Policy in 2007.

Brinkley is a prolific and acclaimed historian, writer, and editor. Brinkley and historian Stephen Ambrose wrote three books together: *The Rise to Globalism: American Foreign Policy Since 1938 (1997)*; *Witness to History* (1999); and *The Mississippi and the Making of a Nation: From the Louisiana Purchase to Today* (2002), a National Geographic Society best seller published on the bicentennial of Thomas Jefferson's decision to double the size of the United States. Six of his award-winning books have been selected as New York Times "Notable Books of the Year," including "Tour of Duty: John Kerry and the Vietnam War" (William Morrow, 2004); "Voices of Valor: D-Day: June 6, 1944" (Bulfinch, 2004), written with Ronald J. Drez; "The Great Deluge: Hurricane Katrina, New Orleans, and the Mississippi Gulf Coast" (HarperCollins, 2006); "The Reagan Diaries" (HarperCollins, 2007), which Brinkley edited; and "The Wilderness Warrior: Theodore Roosevelt and the Crusade for America" (HarperCollins, 2009).

Kenneth Brower
Ken Brower is the son of the pioneering environmentalist David Brower. Ken's first memories are of the wild country of the American West. In 1967, at age 22, he spent five weeks walking across the Arctic National Wildlife Refuge as fieldwork for his 1971 book *Earth and the Great Weather: The Brooks Range*. The author of many books and magazine articles, he specializes in natural history and environmental issues. His work has taken him to all the continents. He lives in Berkeley, California.

Stephen Brown
Stephen Brown received his doctorate from Cornell University, where he studied restoration of wetland bird habitats. He currently serves on the executive committee of the U.S. Shorebird Conservation Plan Council and is a member of the Society for Conservation Biology, the Society of Wetland Scientists, and the Waterbird Society. As the Manomet Bird Observatory's director of shorebird science, Brown works on a wide variety of science and policy issues related to protecting this imperiled group of birds. Brown was the lead author of the U.S. Shorebird Conservation Plan, which brought together wildlife managers and policymakers from all 50 states to develop a coordinated strategy for restoring declining populations of shorebirds. Brown has an active research program in the Arctic, where his work helps to determine potential impacts of oil development on nesting shorebirds in the Arctic National Wildlife Refuge and in the Teshekpuk Lake Special Area of the National Petroleum Reserve—Alaska.

President Jimmy Carter
Jimmy Carter served as the 39th President of the United States from 1977 to 1981. He was the recipient of the 2002 Nobel Peace Prize and is the only U.S. President to have received the award after leaving office. Before he became President, Carter served two terms as a Georgia state senator and one term as Governor of Georgia, from 1971 to 1975. Among his many accomplishments and interests, he has been a U.S. naval officer, a peanut farmer, an acclaimed author, a builder of homes for Habitat for Humanity, and an avid fisherman.

As President, Carter created two new cabinet-level agencies, the Departments of Energy and Education. He established a national energy policy that included conservation and new technologies. He is one of the

true heroes of Alaska and its environment. In 1980, Carter signed the historic Alaska National Interest Lands Conservation Act, which protected millions of acres in Alaska as national parks and national wildlife refuges, including significantly expanding the boundaries of the Arctic National Wildlife Refuge. It is a testament to his continuing commitment to protecting the Arctic Refuge that President Carter has agreed to serve as the honorary chairman of the Alaska Wilderness League's board of directors.

Glenn Elison
Glenn Elison has devoted much of his career to the protection of Alaska's fish and wildlife resources. He has served as refuge manager for Alaska Peninsula and Arctic refuges and as an assistant regional director for the U.S. Fish and Wildlife Service before assuming his current role with The Conservation Fund, a national non-profit that works to protect fish and wildlife habitat and community open space.

In Alaska, Elison has been involved in the protection of more than 300,000 acres of wildlife habitat. Elison was instrumental in the development of the Southwest Alaska Conservation Coalition, an umbrella organization of groups working to identify, prioritize, and protect habitats for fish, wildlife, and cultural and recreational values. Elison served as the chief negotiator and administrator for the U.S. Fish and Wildlife Service for several large habitat conservation agreements completed under the Exxon Valdez oil spill settlement. Under Elison's direction, over 200,000 acres of wildlife habitat was protected on Kodiak Island.

Lynn Greenwalt
A second-generation employee of the U.S. Fish and Wildlife Service who grew up on remote refuges in the West, Lynn Greenwalt started his Federal service with summer jobs at the Wichita Mountains National Wildlife Refuge in Oklahoma from 1946 to 1952. He earned his bachelor's degree in zoology from the University of Oklahoma in 1953 and a master's degree in wildlife management from the University of Arizona in 1955. After service in the U.S. Army, he began a career that would take him to the top of the U.S. Fish and Wildlife Service.

Greenwalt worked on two national wildlife refuges in Utah, two in Oklahoma, and one in New Mexico before being assigned to regional offices in Albuquerque and Minneapolis, occupying staff and supervisory positions in the Division of Wildlife Refuges. In 1970 he was named supervisor of law enforcement in the Service's Portland regional office; a year later, he became chief of the Division of Wildlife Refuges in Washington, D.C. During the next few years, he served in a variety of assignments, including assistant to the director of the agency and assistant director for operations. In 1973 he was appointed director of the Fish and Wildlife Service, where he remained until 1981, having served in this capacity under Presidents Nixon, Ford, and Carter.

In 1982 Greenwalt joined the staff of the National Wildlife Federation, the Nation's largest private non-profit conservation education organization. He retired from the National Wildlife Federation in 1996 and lives in Rockville, Maryland. He is a regular lecturer at the National Conservation Training Center whose inspirational appearances are always well-attended by the next generation of wildlife managers.

Dr. John Hobbie
Since the mid-1970s, Dr. John Hobbie from the Marine Biological Laboratory in Woods Hole, Massachusetts, has been travelling to Alaska during summer months to look at Arctic tundra and freshwater ecosystems near Toolik Lake in Alaska's North Slope region. Noticeable changes have occurred over the past 30 years in this area, the site of the Arctic Long-Term Ecological Research Project. This program has 26 collaborative projects in which researchers are monitoring a variety of ecosystems in the United States, the Antarctic, and on a Pacific coral reef. More than 1,800 scientists and students are taking part in these research projects.

Sarah James
Sarah James is a Neetsaii Gwich'in Athabascan Indian from Arctic Village, Alaska. She was raised in the traditional nomadic way. James was one of the first recipients of the Ford Foundation's "Leadership for a Changing World" award and a co-recipient of the prestigious Goldman Environmental Prize for her work with the Gwich'in steering committee to protect the calving and nursery grounds of the Porcupine River caribou herd on the Arctic Refuge coastal plain. The Porcupine caribou herd has sustained the Gwich'in for over 20,000 years.

Jeff Jones
Jeff Jones began his outdoor photography more than two decades ago. Since that time, he has created significant bodies of work related to the Arctic National Wildlife Refuge and California's Sierra Nevada. Jones' keen understanding of the natural world, coupled with decades of experience in remote backcountry and wilderness areas, form the foundation for his exceptional landscape photography. His works, from sweeping panoramic vistas to intimate, abstract studies of nature's elemental forms, reveal his respect for and endless fascination with landscapes, ranging from the stark to the sublime. By seeing the world anew through the camera's lens and by refining his photographic craft through the use of digital technologies, Jones provides us with images at once exquisitely envisioned and beautifully rendered.

Dr. Roger Kaye
Roger Kaye has been the wilderness specialist and pilot with the Arctic National Wildlife Refuge for 25 years. He has taught wilderness management and environmental psychology at the University of Alaska. While his Ph.D. research was focused on the philosophical and psychological underpinnings of the

wilderness concept, much of his work with the U.S. Fish and Wildlife Service has focused upon on-the-ground management issues. He has written popular and journal articles on wilderness and related subjects and is the author of *Last Great Wilderness: The Campaign to Establish the Arctic National Wildlife Refuge*.

Dr. Robert Krear

Dr. Robert Krear has served man and beast throughout his life, teaching biology at four universities, serving as a ranger-naturalist in eight national parks, and fighting for freedom in the Italian Alps in the 10th Mountain Division during World War II. In his latest book, Four Seasons North, Krear chronicles four scientific expeditions that would lead to the preservation and understanding of the natural environment in Arctic and Subarctic regions of North America. Throughout his expeditions, he carefully reported his findings in journals that would culminate in his latest publication. In 1956, Krear participated in the Olaus Murie Arctic Brooks Range expedition, which set in motion the creation of the Arctic National Wildlife Refuge in northeast Alaska. His film of that expedition was released widely as "Letter from the Brooks Range." Earlier, Krear enjoyed his research and exploration with the U.S. Fish and Wildlife Service on the Pribilof Islands in the Bering Sea.

Jim Kurth

As deputy chief of the Division of National Wildlife Refuges, Jim Kurth currently oversees the nation's largest refuge—Arctic National Wildlife Refuge. Kurth began his refuge system career in 1979, and served at five refuges—Mississippi Sandhill Crane, Loxahatchee in Florida, Bogue Chitto in Louisiana, Seney in Michigan, and Ninigret in Rhode Island—before moving to Alaska and Arctic Refuge, where he served as manager for five years. Kurth then went to Washington, D.C., to become the refuge system's deputy chief in 1999. His most notable personal hallmark is his passion as a tireless defender of refuge system's wilderness areas. His legacy is as staunch defender of Arctic Refuge wilderness and the encompassing United States wilderness system.

Kurth's accomplishments include 30 years of refuge service, becoming well-versed in all Fish and Wildlife Service programs and their development; his commitment to conservation leadership; maintaining Service excellence and integrity, despite the odds; and his elegance of word and eloquence of voice.

Fran Mauer

Fran Mauer came to Alaska 40 years ago to attend graduate school at the University of Alaska at Fairbanks, where he subsequently earned a Master of Science degree in zoology in 1974. He began his professional career with the U.S. Fish and Wildlife Service in 1974 as a wildlife biologist. From 1976 to 1980, Mauer provided resource data and analysis in support of the proposed Alaska National Interest Lands Conservation Act, which ultimately established new national parks, wildlife refuges, wilderness areas, and wild rivers in Alaska. He worked as a wildlife biologist at the Arctic National Wildlife Refuge for 21 years. In addition to studies of moose, Dall sheep, and caribou, Mauer conducted field surveys for peregrine falcons and golden eagles at the refuge and studied interactions between caribou and golden eagles on the calving grounds of the Porcupine caribou herd. He retired from the Fish and Wildlife Service in 2002. In 2005 he was the recipient of the Alaska Conservation Foundation's Olaus Murie Award for his professional contributions to conservation in Alaska.

Forrest McCarthy

Forrest McCarthy has been a wilderness advocate and explorer for more than 20 years. While participating in the 50th anniversary expedition in 2006 of the historic 1956 Murie-Sheenjek expedition, McCarthy replicated historic landscape photos that he later analyzed for his graduate thesis, "Land Cover Change in Arctic Alaska." McCarthy holds a bachelor's degree in outdoor education from Prescott College and a master's degree in geography from the University of Wyoming. He is a senior guide with Exum Mountain Guides and has led expeditions from Alaska's Mount McKinley to the Central Plateau of Antarctica. Currently McCarthy is public lands director for Winter Wildlands Alliance.

Brad Meiklejohn

Brad Meiklejohn is a packrafting pro, avid birder, hiker, mountaineer, and experienced outdoorsman. He holds a master's degree in botany from the University of Vermont. In the past, he has been associate director at the Utah Avalanche Center and is now the Alaska representative of The Conservation Fund. Founded in 1985, The Conservation Fund is dedicated to protecting wildlife habitat and open space. It has protected 5 million acres nationwide, including 300,000 acres in Alaska. It has also been involved in the conservation of more than 1.5 million acres of forestland, community green space, and historic sites around the country. Says Meiklejohn, "We provide the know-how and find the funds to buy ecologically or culturally significant land and water, moving quickly on behalf of public agencies to secure prime acres in the face of imminent threats."

Pamela Miller

Pamela A. Miller is Arctic program director at the Northern Alaska Environmental Center in Fairbanks (www. northern.org) where she has been since 2006. For over three decades she has worked to protect the ecological integrity and wilderness values of the Arctic National Wildlife Refuge. She also seeks protection for sensitive habitats like Teshekpuk Lake wetlands and other special areas in the National Petroleum Reserve—Alaska and in the Beaufort and Chukchi Seas. She is an Arctic researcher who specializes in cumulative environmental and human impacts of North Slope Alaska land and offshore oil and gas development. As a wildlife

biologist for the U.S. Fish and Wildlife Service for eight years, she studied birds at Arctic Refuge, monitored seismic oil exploration, and evaluated North Slope oil development impacts. She began her professional career with wildlife studies on Nisqually National Wildlife Refuge in Washington State. She worked for The Wilderness Society as assistant Alaska regional director and Alaska program director in Washington, D.C. and chaired the nationwide Alaska Coalition to protect Arctic Refuge. For 10 years she ran Arctic Connections, a small business focused on Arctic Refuge wilderness guiding and Arctic oil impact research for non-profit organizations, media, and VIPs. Miller, who grew up in Cleveland, Ohio, has a B.S. in wildlife biology from Evergreen State College and an M.S. in journalism from the University of Oregon. In 2009, Miller received the prestigious Wilburforce Conservation Leadership Award, and in 2010 was honored as an "Arctic Hero" by the Alaska Wilderness League.

Dr. Matt Nolan and Kristin Nolan

An outspoken, passionate glaciologist, Matt Nolan has devoted his professional career to studying the Arctic and attempting to understand the impacts of climate change. Since 2003, Nolan and his research team have taken two trips each year to the glacier to build on observations that began as part of the International Geophysical Year in 1957-58. With a 50-year research record, the McCall Glacier is one of the longest-studied Arctic glaciers, which gives scientists a data set against which to compare modern findings. The team is measuring everything that could change over time, including mass balance; ice volume, temperature, and velocities; bed properties; albedo (surface reflecting power); and local weather to develop a comprehensive data set that can give clues to what's happening atmospherically in the Arctic.

Dr. Dave Payer

Dave Payer joined the staff of Arctic National Wildlife Refuge in 2001. As supervisory ecologist, he oversees the refuge's biological program and coordinates research activities with cooperating scientists. Payer works closely with refuge managers to design biological inventories and monitoring projects that contribute to understanding and protecting refuge resources. Payer is a veterinarian, but was drawn to wildlife research after working on the 1989 Exxon Valdez oil spill in Alaska. He subsequently earned his M.S. and Ph.D. in wildlife ecology. Before joining the refuge staff, he studied mountain sheep in Oregon, forest carnivores in Maine, and raptors and waterfowl in northern Alaska.

Dr. George Schaller

George Beals Schaller is a field biologist with Panthera and with the Wildlife Conservation Society. He was a member of the 1956 Murie expedition to northeastern Alaska that resulted in the establishment of Arctic National Wildlife Refuge. Spending most of his time during the past half-century in Asia, Africa, and South America, he has studied and helped species as diverse as the mountain gorilla, tiger, and giant panda. These studies have been the basis for his scientific and popular writings, including "The Year of the Gorilla," "The Serengeti Lions," "The Last Panda," and "Wildlife of the Tibetan Steppe." He currently continues his research and conservation work on the Tibetan Plateau of China and in Tajikistan, Iran, Brazil, and other countries.

Greg Siekaniec

Greg Siekaniec is a 24-year veteran of the National Wildlife Refuge System, and now directs it as its chief. Just before taking the helm of the refuge system, Siekaniec spent eight years as the refuge manager of Alaska Maritime National Wildlife Refuge, one of the system's most remote and far-flung units, encompassing more than 2,500 islands and nearly 5 million acres.

Among his many achievements at Alaska Maritime, Siekaniec is credited with developing a host of restoration partnerships with national conservation organizations to restore island biodiversity and ridding islands of destructive invasive species—foxes and rats—that had nearly eradicated native seabirds and other wildlife. Alaska Maritime Refuge provides nesting habitat for approximately 40 million seabirds, about 80 percent of Alaska's nesting seabird population.

Jay Slack

James John ("Jay") Slack became director of the U.S. Fish and Wildlife Service's National Conservation Training Center in Shepherdstown, West Virginia, in 2008, the second director of our center of training and education for this Interior Department agency. In his position, Slack also serves as a member of U.S. Fish and Wildlife Service's national directorate.

Slack grew up in Pekin, Illinois, and was educated in its local public schools. He received a B.S. in biology in 1986 and an M.S. in ecology in 1988, both from Illinois State University in Normal, where his academic research in herpetology centered on the speciation of rare frogs in the United States.

After employment with the State of Illinois in fisheries research and in the development of indoor aquaculture systems, Slack joined the Fish and Wildlife Service in 1991 as a herpetologist in the agency's Phoenix, Arizona, ecological services office. In 1993, Slack moved to the Fish and Wildlife Service's headquarters office in Washington, D.C., when he became chief of its endangered species listing program and coordinator of its endangered species consultations with other federal agencies. He went on to supervise the Service's Vero Beach, Florida, ecological services office for nine years, where nationally significant endangered species, water management, and wetlands conservation issues in this rapidly-developing Sunbelt state combined to make it one of the agency's busiest and most high-profile responsibilities.

In 2006, Slack became deputy regional director for the Service's eight-state Mountain/Prairie region, headquartered in Lakewood, Colorado. There, he helped

oversee operations in this sprawling, complex region, where endangered species protection, prairie pothole conservation for migratory birds, and water and fisheries management in some of North America's greatest river systems typified the Service's mission. Twelve national fish hatcheries and 110 national wildlife refuges—nearly one-quarter of the Nation's total—are located in the Mountain/Prairie region. Slack earned the U.S. Department of the Interior's meritorious service award in 2005.

LaVerne Smith

LaVerne Smith is currently the deputy regional director for the U. S. Fish and Wildlife Service's Alaska region. LaVerne most recently completed a detail initiating Region 7's science applications program and launching the Alaska landscape conservation cooperatives. Smith served on the Service's National Climate Change Team, which developed its new climate change strategic plan, released in September 2010. Smith joined the Alaska region in April 1999 as the assistant regional director for fisheries and ecological services. Before coming to Alaska, she served as the chief of the Fish and Wildlife Service's national endangered species program from 1995 to 1999. She began her career with the Fish and Wildlife Service in 1978 in the endangered species program, working to conserve endangered plants of the Southeast and Southwest. Smith also has served in management positions in the Fish and Wildlife Service's habitat conservation programs. In the early 1990s she led the Service's coastal program, supervised the "Partners for Wildlife" program and the National Wetlands Inventory, and lead the Service's "no net loss of wetlands" and ecosystem approach for management initiatives for the agency's Washington, D.C. office. Before joining the Fish and Wildlife Service, Smith worked for the North Carolina Department of Natural Resources, the North Carolina Natural Heritage Program, and The Nature Conservancy. LaVerne received a B.S. in botany and a M.S. in ecology from North Carolina State University. She is a native of North Carolina.

Thomas Strickland

Tom Strickland serves as the Chief of Staff to Interior Secretary Ken Salazar and as the Assistant Secretary for Fish and Wildlife and Parks at the Department of the Interior.

Mr. Strickland's legal career has included significant positions in both the public and private sector, as well as extensive involvement in civic and non-governmental organizations.

Strickland served as United States Attorney for the District of Colorado from 1999 through 2001, acting as the top Justice Department official for Colorado. He was sworn in as U.S. Attorney the day after the tragic Columbine shootings.

From 1977 to 1979, Strickland served as law clerk to U.S. District Judge Carl O. Bue, Jr. He later served as the chief policy advisor for Colorado Governor Richard D. Lamm from 1982 to 1984, advising the governor on all policy and intergovernmental issues. He also served on and chaired the Colorado Transportation Commission from 1985 to 1989, overseeing a $1 billion budget.

Strickland practiced law in the private sector for over 20 years, serving with several prominent Denver law firms, where he was a senior partner in charge of the regulatory, administrative, and public law practice. From 2003 to 2007, he served as Managing Partner for the Colorado offices of the international law firm Hogan Lovells, representing clients on a wide range of litigation, business, and regulatory matters. During his career he has had extensive involvement in civic and community affairs, serving as legal counsel to the Denver Metro Chamber of Commerce and as a founder and board member of Great Outdoors Colorado, the lottery-funded program that has invested over $600 million into parks, wildlife, and open space programs in Colorado.

Immediately prior to joining Interior, Strickland was executive vice president and chief legal officer of UnitedHealth Group, a Fortune 21 company and the largest health care provider in America.

Strickland received his bachelor's degree in English literature, with honors, from Louisiana State University, where he was an All-SEC Academic Football Selection. He received his J.D., with honors, from the University of Texas School of Law. He is a member of the Colorado, Minnesota, and Texas Bars.

Mark Terry

Mark Terry has produced film and television for the past 20 years. He created and wrote the documentary specials *Earth's Natural Wonders* and *Mysteries of Sacred Sites* for the Discovery Channel. The success of these and other documentary projects earned him an invitation from the Government of China to produce a series of films for the prestigious Museum of History in Hong Kong. Mark lived in Hong Kong for a year, producing eight films for the museum's permanent exhibit.

Terry's adventurous spirit has brought him to exotic locations on all seven continents, but none more impressive to him than the Arctic. After a vacation in Alaska in the mid-1990s, he fell in love with the majestic beauty of the landscape. Subsequent trips to Alaska and the Arctic inspired Terry to get involved with northern research programs.

Working closely with the world's scientific community in Antarctica and the Arctic earned him the recognition of the United Nations Environment Programme. His last two films—*The Antarctica Challenge: A Global Warning* and *The Polar Explorer*—were made in partnership with the UNEP, and both premiered at climate change conferences in Copenhagen and Cancun.

Terry is one of only 166 Canadian members of The Explorers Club, a 104-year-old organization based in New York City and comprised of the world's greatest explorers. Last October, he was awarded the Canadian chapter's highest honor—the Stefansson Medal—for his "outstanding contribution to international field science research."

As a member of the Royal Canadian Geographical Society, the Canadian Council for Geographic Education, the Canadian Network for Environmental Education and Communication, the Royal Canadian Geographical Society, and the University of Alberta's Northern Research Network, Terry teaches and speaks regularly about the environmental issues affecting the fragile ecosystems of the polar regions and, by extension, the world.

Mark is a graduate of York University and the University of Alberta's Antarctic program.

Ave Thayer

As a boy growing up in Idaho, Ave Thayer loved wild places. He came to Alaska as a young man, out of curiosity, and spent his entire career there. At the University of Idaho, he studied electrical engineering, forestry, wildlife management, and biology, but he never got around to taking enough English courses to graduate. Working later for the Alaska Game Commission when it was still part of the U.S. Fish and Wildlife Service, he had to write reports. He recalls, "I could see being the subject of a lot of ridicule or turning in a badly done report, so I put in a lot of extra photos. Those reports made a hit. They weren't as dry and scientific as they should have been." Thayer believes that those reports—and his taking the Wilderness Act very seriously—were key to his appointment as the first manager of Arctic National Wildlife Refuge in 1969, a position he held until his retirement in 1982. Thayer believes it was not radical or unrealistic to expect that at least some of the undefiled country still remaining in Alaska should be preserved.

Dr. Amy Vedder

An expert in conservation and ecology, Dr. Amy Vedder is senior vice president for conservation at The Wilderness Society in Washington, D.C. For more than 30 years her work has been dedicated to wildlife and wildland conservation, applying ecological and social science to save biologically rich and threatened places. Her work with The Wilderness Society focuses on protection and sound stewardship of America's wild lands, from wilderness to the sustainable use of wild resources. Before joining The Wilderness Society, Vedder served as senior advisor to the Rwandan Environment Management Authority, addressing environmental issues and national parks. Formerly, she served as vice president and director of the living landscapes program at the Wildlife Conservation Society, a strategic initiative geared toward balancing the needs of wildlife and people. She also directed the Wildlife Conservation Society's Africa program and was senior liaison to multi-lateral agency programs.

Amy Vedder is widely known for her pioneering studies of mountain gorillas in Rwanda during the late 1970s and as co-founder, with husband Dr. Bill Weber, of the Mountain Gorilla Project. She is the author of several books, including *In the Kingdom of Gorillas*, which she wrote with her husband, and is the subject of a biography written for middle school students, *Gorilla Mountain*.

Tom Veltre

Tom Veltre brings more than two decades of media production experience to his role as proprietor of The Really Interesting Picture Company. Formerly in-house media producer for the Wildlife Conservation Society, Veltre writes, shoots, and edits in a wide variety of formats for a broad spectrum of venues, ranging from documentaries, news, and public affairs programming to interactive museum exhibits, instructional materials, and new media applications. As a producer/cinematographer, he has covered stories on four different continents, and his work has been broadcast by all the major North American commercial television networks, PBS, Discovery Channel, National Geographic Channel, CNN, BBC, NHK (Japan), and Fuji TV (Japan). Veltre holds an undergraduate degree in music education from the Crane School of Music and did his master's and doctoral work in media ecology at New York University under Neil Postman. He is also a board member of Filmmakers for Conservation and an adjunct professor in communications at Fordham University and the New School University media studies graduate program. In these positions he explores the interface of mass communication and the environment.

Richard Voss

Born and raised in the San Francisco Bay area of California, Richard Voss served as a paramedic during the Vietnam War in the late 1960s. He graduated from Humboldt State University with a biology degree in 1973. Richard has worked as a biological aid/technician, biologist, public use specialist, law enforcement officer, firearms/defensive tactics instructor, assistant and deputy refuge manager, and project leader in seven states and on fifteen refuges in the U.S. and Trust Territories, for the U.S. Fish and Wildlife Service for the last 37 years. Voss also has served as a technical advisor with the International Crane Foundation and the Service's Office of International Affairs in China, Siberia, Mongolia, and Nepal. In 1994, Voss made one of the most extreme career moves in government: he left the 70-degree year-round temperatures of the Kauai National Wildlife Refuge Complex in Hawaii for the -70-degree winters of Tetlin Refuge in Tok, Alaska. Voss moved to Fairbanks with Katherine, his wife of 38 years, to steward the Arctic Refuge in 1999.

Ed Zahniser

Ed Zahniser is the youngest of Alice and Howard Zahniser's four children. His father worked closely with Olaus and Mardy Murie as executive secretary and later director of The Wilderness Society from 1945 until his death in 1964. Ed was in the Sheenjek River Valley with Olaus and Mardy and Stephen Griffith in summer 1961. From there they went to present-day Denali National Park, where Adolph and Louise Murie lived at Igloo Creek ranger cabin while Adolph worked on his book *The Grizzlies of Mount McKinley*. Ed and Stephen, both 15 years old then, collected bear scat for Adolph with retired logger Joe Hankins. Ed is senior writer and editor with the publications group of the National Park Service in Harpers Ferry, West Virginia. He has written and/or co-written and edited handbooks for Yosemite, Grand Teton, Great Smoky Mountains, Glacier Bay, Yellowstone, Chesapeake and Ohio Canal, U.S. Virgin Islands, and other national parks. He edited his father's Adirondack writings, *Where Wilderness Preservation Began*, and his mother's 1956 journal, *Ways to the Wilderness*. He is co-founder and poetry editor of the local quarterly tabloid, Good News Paper. Ed is the author of three books of poetry, most recently "Mall-Hopping with the Great I Am," and a humorous history of Shepherdstown, where he and Christine Duewel have lived since 1977.