

# An Inarticulate Truth: Communicating the Science of Global Climate Change

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I HEARD RECENTLY THAT ON A SCIENTIFIC SURVEY OF WHAT PEOPLE FEAR MOST, they put public speaking first ... and death second. That means, statistically, that the person delivering a eulogy at a funeral would rather be in the coffin than standing up in front of the group. But I am honored to be speaking to you. Thank you for the invitation to join you here tonight. I want to open with two short passages about essentially the same thing, but written by two very different authors. Author 1:

Boreal habitats in Alaska support 130 species of breeding landbirds, including 68 species that migrate to Neotropical wintering areas. Significant population declines have been documented for many of these species in temperate regions over the past 30 years. Little information exists on the status of Alaskan populations in relation to those of temperate regions, habitat requirements in the north, or methods that can be used to monitor landbird populations in arctic and subarctic biomes. Designing a monitoring program for Alaska requires special considerations: the effects of long daylength, the constricted breeding season, diversity of landbird habitats, restricted road access to vast areas, expensive logistics, and high turnover of observers. This research project has three major goals: (1) to design and test methodology for a cooperative, regional program to monitor population trends of landbirds breeding in northern ecoregions; (2) to investigate relationships between the distribution of breeding landbirds and terrestrial habitats at the landscape level; and (3) to examine population dynamics governing population trends in boreal regions.

Author 2:

I marveled at this intense and concentrated beauty on the vast table of the plain. I walked on to find Lapland longspurs as still on their nests as stones, their dark eyes gleaming. At the nest of two snowy owls I stopped. These are more formidable animals than plovers. I stood motionless. The wild glare in their eyes receded. One owl settled back slowly over its three eggs, with an aura of primitive alertness. The other watched me and immediately sought a

bond with my eyes if I started to move. I took to bowing on these evening walks, I would bow slightly with my hands in my pockets, toward the birds and the evidence of life in their nests, because of their fecundity, unexpected in this remote region, and because of the serene arctic light that came down over the land like breath, like breathing.

The first passage was from the U.S. Geological Survey's Alaska Science Center website. The second passage was from Barry Lopez, in his book *Arctic Dreams*.

Both of these writers were seeing the same thing and communicating about it differently. One scientifically, one poetically. One clinically, one emotionally. One connects to the right brain, the other to the left brain. One may spur us to think, the other to act.

Tonight, I want to talk about the convergence of those two voices and why we need both.

So there will be no doubt about where I stand, I am going to just state right up front that I am an advocate for mountains and their ecology. I am going to assume that you too are advocates. You are like a medical doctor who has been presiding over the care of a particularly attractive patient, suffering from a chronic disease, but you have fallen in love with the patient. It's personal for you now. It's personal for me. The challenge we have is to make it personal for everyone.

I cannot sit back and watch these magnificent resources decline.

At least in this room, I hope we all agree that the climate is changing and at least some of the causes can be directly linked back to the activities of humans. Anyone who really doubts that flunked fifth-grade science and should be a card-carrying member of the Flat Earth Society.

As with any complex scientific issue, there are many unanswered questions. There are many who will publicly offer their doubts. But for this crowd here tonight, the debate is over.

I know firsthand the results of your research on receding glaciers because I have hiked the melting glaciers in Alaska and climbed the slopes of Mount Rainier across rocky fields that were once under ice.

I can personally verify the declining density of the snow pack of the Cascades because I ran the snow surveys in Crater Lake for a number of years and for awhile carried the satellite downlink from the snow-tell site on Mount Rainier on my palm pilot.

I can attest that this has been the largest year of wildfire since the mid-1960s—over 8 million acres burned—just by looking into the eyes of my fire staff, who are worn to a frazzle.

I get it, you get it, but there are several million people out there, in Portland, in Seattle, in Omaha, who need to hear the results of your research and begin to understand how it is going to affect them, personally.

The other day, I was on a plane back to Oakland from Denver, and working on a pile of papers. A stylish, professional woman, perhaps in her mid-fifties, was sitting next to me. She noticed the National Park Service logo on my stacks and asked about my work. Our conversation led her to comment that she had lived in Tacoma, Washington, for 25 years.

When I responded that I had been the superintendent of Mount Rainier National Park, she said, "That extinct volcano?" I said, "You mean the most dangerous volcano in North America?" She looked astonished. I went on to describe, in detail, the volcanic history and

the probably future of Mount Rainier. As I droned on and on about hydrothermally altered rock and pyroclastic debris flows, I noticed that she seemed to be eyeing her copy of *Vogue* magazine, perhaps sorry that she started this conversation.

So I changed my tactics.

I asked if she had ever been bicycling along the Foothills Trail in Orting. She said yes, and then I said, “Did you know that developers building homes in the Orting valley have been finding the stumps of a forest, buried under 15 feet of concrete-like mud from Mount Rainier?”

I said, “Did you know that 6,000 years ago the Ocoela mudflow from Mount Rainier roared down the White River valley towards Orting at 60 miles an hour at the height of the Space Needle, and that the mud shaped the bottom of the Puget Sound?”

Now it was getting personal. The message the same ... the delivery different. The first was about the mountain, the second was about her.

In the last ten years the National Park Service and the U.S. Geological Survey have been working with the local counties and the media to change the people’s understanding of Mount Rainier from an extinct volcano to a serious potential hazard, not to be taken for granted.

Over last two weeks, I have been to one place that reminds me that by the application of excellent research and a concerted effort of education, we together can affect public opinion. I was in Sequoia and Kings Canyon National Parks for a series of meetings that involved several presentations by the fire education staff. A young woman and her assistants held up maps of the park and detailed the fire history as a whiff of smoke drifted down from the several thousand acres on fire in the park. She detailed how a few years ago a wildland fire-use fire burned right above an occupied campground throughout most of the summer as visitors went about their recreational pursuits. Interpreters roved the campground with reassuring messages about safety and the fire.

I had to take a moment to remind myself how far we have come from the highly effective days when Smoky Bear had the American citizen convinced that all fire was bad—hey, it almost killed Bambi! In the very early days of prescribed burns in Crater Lake National Park, the rangers had to scrape the burned bark off of the ponderosa pines on the entrance road side of the trees so as to not upset the public. Today, we station interpreters in the parking lot over natural fires to talk of their benefits to the ecosystem. This is an extraordinary sea change in public opinion.

About five years ago the National Park Service launched what is known as the Natural Resource Challenge. The Challenge was designed as a multiyear, \$100 million effort to institutionalize a long-term inventory and monitoring program for natural resources in the all of our natural resources units of the system. Now some of you might think that for a 90-year-old agency like the NPS to just now be getting around to developing such a program seems odd. I could tell you why, but that would take another long talk. For those of you who really want to know the sordid details of our historical failings, I suggest you read *Preserving Nature in the National Parks*, a great historical account of the dominance of the agency by landscape architects, written by Richard West Sellars.

Many of us combat biologists had been arguing for such an initiative for decades. When then-NPS Deputy Director Deny Galvin finally signed on to our great push for the Natural Resources Challenge, I accused him of having a “deathbed conversion.” When I looked him in the eye and said, “Deny, a bunch of us young whippersnappers have been telling you this for years,” he responded with: “Yes, but you were so inarticulate.”

Perhaps we were inarticulate. But we make up for it with passion and a strong dose of whining.

Someday, I will write my management excellence book to stand beside Steven Covey’s *Seven Habits* or the *One Minute Manager*. I will call my book *Winning through Whining*.

As a result of the Challenge, the NPS divided up the parks into inventory and monitoring networks whose boundaries basically coincide with Robert Bailey’s ecoregional classification of the United States. The networks in the NPS’s Pacific West Region, with a few example parks, are:

- North Coast and Cascades: Olympic, North Cascades, and Mount Rainier
- Klamath: Redwood, Crater Lake, Lassen
- Columbia: Lake Roosevelt, Hagerman Fossil Beds, and Craters of the Moon
- Sierra: Yosemite and Sequoia and Kings Canyon
- San Francisco Bay: Point Reyes and Pinnacles
- Mojave: Joshua Tree, Death Valley, and Lake Mead
- Mediterranean Coast: Channel Islands and Santa Monica Mountains
- Pacific Islands: Hawaii Volcano and Haleakala

For the NPS, the Challenge has been one of the more successful programs in decades, pumping nearly 80 million new dollars into the inventory and monitoring program, establishing a network of Cooperative Ecosystem Study Units at various universities, and implementing a series of Research Learning Centers.

I could drone on and on about the long-term benefits of the Challenge, but I want mostly to speak to two aspects: (1) the approach we are using here in the Pacific, and (2) the communication aspect.

As director of the NPS’s Pacific West Region, it has been always my goal to figure out how to institutionalize a program such as this—to ensure that it does not just disappear like the Park Service’s science program did after its dynamic first scientist, George Wright, died at a young age in a car accident over 70 years ago. To accomplish that, I needed to structure everything we do in the Pacific around these ecological networks. They become the core of our organization and therefore we begin to function as a network, thinking like a network and acting accordingly. I can tell you tonight we have accomplished just that. Our superintendents are now operating as boards of directors over these networks, sharing resources, funding, and information and addressing a wide range of issues, not just those related to natural resources. Co-dependencies are forming and so then do the institutional requirements that keep the daily monitoring of park resources so integral to their thinking that they would no more stop the sampling of the air than close the visitor center.

I mentioned earlier the advent of Research Learning Centers as part of the Challenge. These are designed as an interface between research, researchers, and our communication professionals. We already are able to say many things about the status of the resources in our stewardship, and soon will be able to say much more.

In the hands of our professional communicators we can reach the public: through art, poetry, podcasts, web pages, music, education programs, school curricula, and so on. The opportunities are really exciting.

Two more quotes:

In general, whitebark pine trees in Waterton Lakes National Park, Alberta, and Glacier National Park and Blackfoot Reservation, Montana, have suffered serious declines, while further south, whitebark pine mortality was low and blister rust infection rates were moderate to low.... In the northern portion of the sample area, approximately 30% of the whitebark pine trees were dead, and of the remaining live trees, about 70% were infected with rust and had an average of 25% crown kill. In the Greater Yellowstone Ecosystem, whitebark mortality averaged 7%.

— *USGS Northern Rocky Mountain Science Center*

You know the path, but wander, thrilled, over the bare and pathless rock, as if it were solidified air and cloud. That rocky, misty summit, secreted in the clouds, was far more thrillingly awful and sublime than the crater of a volcano spouting fire.

— *Henry David Thoreau*

I recently asked the Pacific West Region's Science Council and our Natural Resource Advisory Committee to forward to me the top science and conservation issues facing the parks in the west. These are to become our major focus over the next year. Our goals are to better understand their scientific status and also how to communicate effectively with the public what we know and what we don't know. From that we will develop a strategic vision and action plan for the future of the parks of the Pacific West Region. You will note a lot of overlap with CIRMOUNT's "Mapping New Terrain."

### **Key conservation science issues**

**Habitat loss and landscape fragmentation.** Dramatic changes in land use from human developments have resulted in landscape fragmentation and habitat loss in much of the United States. The effects on national parks of large-scale conversion of open space will place increasing stress on the integrity of park ecosystems. Some indicators of this stress are: loss of species, increasing numbers of threatened and endangered species, fragmentation of landscapes, pressure on mobile species, and increases in invasive species. The National Park Service will greatly benefit from improved understanding of fragmentation impacts on park ecosystems, identification of species at risk from fragmentation, and landscape-level techniques to monitor habitat loss and fragmentation changes in parks and surrounding lands. The important roles that parks play in regional conservation efforts—and, conversely, how surrounding activities affect park protection goals—are also critical conservation concerns.

Fragmentation effects also interact with other system stressors, such as invasive species, changing fire regimes, and global climate change, further complicating efforts by parks to conserve and protect resources in increasingly fragmented landscapes.

**Invasive species.** Human activities in and around parks have resulted in multiple introductions of non-native species into park ecosystems. In many cases, these species become major invasive pests, displacing native plants and animals through competitive exclusion, habitat alteration, and predation. Impacts can be severe both spatially and temporally, and have the potential to irreparably alter entire parks and ecosystems. The National Park Service would greatly benefit from better techniques to identify potential invasive exotics, control or eliminate invasive species, and prioritize eradication and control methods to concentrate on those species that pose the greatest risks yet are amenable to control. On a broader scale, techniques to evaluate the long-term dynamics of invasives across park networks and landscapes will help park managers focus control efforts and possibly prevent future invasions. Understanding the characteristics that make non-native species invasive will also benefit parks by providing possible early warning systems and allowing park managers to employ techniques that prevent invasive exotics from becoming established.

**Global change.** Although the degree to which global processes are affected by human activities remains elusive, there is scientific consensus that anthropogenic activities are affecting global climate and atmospheric chemistry, pollutant amounts and distribution, and biotoxin accumulations in ecosystems. These global changes will have far-reaching consequences on National Park Service resource stewardship efforts. If park managers are to formulate strategies to mitigate or adapt to global change effects they must understand the relationship between global change and resource impacts.

**Changing fire regimes.** In many national parks, alteration of historic fire regimes significantly affects ecosystem structure and function, and habitat characteristics. In some instances, past fire prevention has created the need for on-the-ground resource management activities (e.g., prescribed fire) to preserve and protect park resources. In other cases, ongoing human activities in and around parks continue to alter fire regimes, often by creating shorter fire return intervals, with dramatic effects on ecosystems, native vegetation, and exotic species invasions. Effective resource stewardship now requires closer communication and coordination between fire management practitioners, resource managers, and fire ecologists and scientists.

**Unsustainable use of park resources.** As human populations expand and natural areas decrease, national parks are increasingly pressured to provide ecological, economic, and social amenities for the American public. Increasing demands for water, marine resources, energy development, indigenous collection of natural resources, and recreational opportunities within and adjacent to national parks may threaten the function and structure of park ecosystems. National park managers must scientifically define and embrace sustainable park uses and develop strategies to repair damage caused by current and past unsustainable uses (e.g., marine reserves and fishing).

**National parks and the emerging publics of the 21st century.** The social, ethnic, and demographic composition of the United States population is projected to continue changing significantly over the next few decades. With this shift, overall public perception of parks and

park resources may also change, affecting demand for park-related services and perhaps core political support. National Park Service managers need to understand the evolving American social structure and its implications for proactive park management from both local and national perspectives, and use this knowledge to reach out to the public and connect them to parks deeply and emotionally.

**Past and contemporary human interactions with park environments.** Currently, we have limited knowledge of past and even contemporary human interactions with park environments. Recognition and understanding of past uses is necessary for an accurate portrayal of park environments and for the development of policies for sustainable use of parks.

**Park visitor capacity.** Demand for significantly increased and diverse recreational opportunities in many Pacific West national parks can be expected as human populations grow. Managers cannot arbitrarily close park gates to protect park resources; rather, they will increasingly adopt transparent planning and management models such as Visitor Experience and Resource Protection (VERP) or Limits of Acceptable Change (LAC), in which science is applied to understand the effects of variation in visitor use on both park resources and experience quality. NPS managers and planners would receive considerable benefit from better guidance concerning the effective use of scientific information in choosing social or biological indicators and standards, and in making other decisions related to visitor capacity.

**Psychological value of nature.** Research on the effects of urbanization and the loss of wildlands has been dominated by inquiries into changes in biodiversity, air quality, water quality, and similar natural resource measures. Recent research is quantifying the connection between people and nature by measuring its psychological and physical benefits. Natural landscapes provide a barometer for measuring change in social perceptions with the environment. Researchers have detected a social trend called “environmental generational amnesia” that is manifested in children having little experience with nature and natural landscapes. Consequently, they have a modified baseline of experience against which to compare degradation of water, air and the quality of life. Parallel research in psychology has discovered that hospital patients exposed to natural landscapes recover more quickly and that the well-being of people is improved when they are exposed to natural landscapes. This human–natural landscape linkage is fundamental to understanding the psychological significance of the value of parks. If people’s perception of landscapes is shifting because of environmental generational amnesia, then the perceived value of parks may also shift.

Over the next year, my Pacific West networks will be engaging in detailed workshops on these issues with a particular focus on Global climate change. How we deal with them, how we manage our parks in light of these issues and how we communicate the research results and the consequences to the public will be the center of our discussions.

New quote:

A child is a person who is going to carry on what you have started. He is going to sit where you are sitting, and when you are gone, attend to those things which you think are important. You may adopt all the policies you please, but how they are carried out depends on him. He will assume control of your cities, states and nations. He is going to move in and take over your churches, schools, universities, and corporations. All your books are going to be judged,

praised or condemned by him. The fate of humanity is in his hands. So it might be well to pay him some attention.

— *Abraham Lincoln*

Dan Ritchie, chair of the education committee of the National Park System Advisory Board and chancellor emeritus at the University of Denver, was our keynote speaker at the Pacific West Region's Managers Conference in 2005. Ritchie there stated that:

The Board believes there is a distinct and critical national purpose embedded in this mission (of the NPS). It is to promote understanding and respect for the values, principles and practice of our democracy. National Parks are places where people experience and learn about their country first hand—its history, cultures, geography and ecology—and what it means to be a responsible steward and citizen of this republic.

He went on to suggest the following core outcomes of the education mission of the NPS:

1. That people have a powerful understanding and connection to the American land, its biodiversity and its stories;
2. That people broadly share an ethic of stewardship for the earth's natural and cultural heritage and are willing to work collaboratively and respectfully for conservation;
3. That they are empowered with a sense of optimism, resourcefulness, and a commitment to one another, inspired by all we have accomplished throughout our history, often in the face of adversity and conflict; and
4. That people practice civic engagement in many different aspects of their lives with a commitment to responsible citizenship empowered and encouraged by their educational experiences in parks.

The core of his message was that the NPS should think of itself not just as the passive keeper of places where the actions of citizens changed the world, such as Independence Hall where Jefferson and others penned the Declaration, but as an active agent of change, by using its position in the American psyche and its inventory of America's most treasured places to inspire the public to become more civically engaged.

Last year, the NPS hosted 278 million visitors to our parks. To paraphrase President Theodore Roosevelt, the parks are a bully pulpit.

In Yosemite National Park, there was a recent resurvey of the work pioneered by the biologist Joseph Grinnell and his colleagues in 1915. The work is featured at this conference. This time, armed with live traps instead of snap traps, the team resurveyed the small mammals of Lyell Canyon. They found significant changes in the populations of ground squirrels, pikas, piñon mice, and alpine chipmunks. Some of them had moved up in elevation by 2,000 feet since being surveyed by Grinnell 100 years ago. These are indicators of global climate change. We all know too that these little creatures can only go so far up, until they are popped right off the mountaintop into extinction.

You are the Joseph Grinnells of this generation, laying down the foundation of an understanding of parks that will be a platform for management action and public awareness. You are also the candles noted in Carl Sagan's last book, *The Demon-Haunted World: Science as*



*a Candle in the Dark*. Your work illuminates a changing world and compels us to act accordingly.

Within this message, I think there is optimism—and it is found within our parks and in the work you do here this week. For the parents in this room, we must offer hope for the future of the environment. This week, as you sit through yet one more depressing PowerPoint on the latest global climate research results, I ask you to be thinking of how to communicate what you are learning, through your own avenues and through the bully pulpits of the parks.

Two more quotes:

The larger glaciers are now approximately one-third their size in 1850 (range, 23–38%) and numerous smaller glaciers have disappeared. There has been a 73% reduction in the area of Glacier National Park covered by glaciers from 1850–1993. Only 27 km<sup>2</sup> of glaciers remain from the 99 km<sup>2</sup> which previously existed. Out of 84 watersheds, only 18 have 1% glacier cover, 8 have 2%, and 4 have 3%. Average glacier area in the accumulation zone for September 1993 was 35%, indicating negative mass balances for most glaciers and continued shrinkage.

— *USGS-Biological Resources Discipline Glacier National Park Science Center*

As long as I live, I'll hear waterfalls and birds sing, I'll interpret the rocks; learn the language of the flood, storm, and avalanche. I'll acquaint myself with the glaciers and wild gardens and get as near the heart of the world as I can.

— *John Muir*

So, my friends, go out and get as close to the heart of the world as you can, listen, and let the rest of us know how she is faring.

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