The Rhetoric of Denial

Climate Warming Denial and the Plight of Grizzly Bears

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Introduction

I grew up on a small ranch in the Black Hills of South Dakota. Our property was at about 5200' elevation surrounded by ponderosa pine forests graced with aspen groves bordering the meadows and white spruce and paper birch on north slopes. Our marshy bottomlands were overrun during spring with small frogs called spring peepers. A small creek that ran through our meadows was chock full of trout that served as a dietary staple under circumstances that managed to elude South Dakota's game wardens.

All of this is history. Birch have long since died out on our ranch and the aspen groves are not too far behind. Spring peepers disappeared several decades ago, along with the wet bottomlands. During summer, the water in Hay Creek is too warm and flows too vagarious to support more than a handful of trout. Summers and winters are warmer; both are more often drier.

These changes are real, and not the product of a foggy memory. Changes in climate are borne out by long-term weather records, and my teenage fascination with photography provides undisputable documentation of the demise of birch and aspen. The eerie silence of spring is its own testimony to the disappearance of spring peepers and their mating cacophony.

These losses, in a place I deeply love, have long been a source of grief for me. During the early 1970s I readily chalked them all up to natural variation in climate—barring, of course, the devastations directly attributable to Forest Service timber management. During the mid-1980s, however, that changed, partly because of my exposure to prescient publications by the likes of Stephen Schneider [1], Charles Baes [2], and James Hansen [3], and partly because of conversations with a forward-thinking wildlife research at Montana State University named Harold Picton.

All these scientists had seen the writing on the wall regarding the inescapable effects on our global climate of rapidly increasing atmospheric CO_2 concentrations. For them, it was largely a matter of chemistry and physics, although when rereading their publications from the 1970s and early 1980s I am struck by how accurately they foretold the pace and nature of anthropogenic climate change.

Even back then, they were advocating reduction of CO_2 emissions and proactive mitigation strategies. This was 40-45 years ago.

Without intending to be self-complementary, I found the logic and evidence presented by these researchers to be compelling, if not irrefutable. Dr. Picton subsequently recruited me to co-author a 1986 conference paper that, to my knowledge, constitutes the first foray by any researchers into the topic of how climate change might affect bears [4]. This collaboration catalyzed a life-long interest in how climate change affects ecosystems, with a focus on bears.

The first product of my solo inquiries into climate impacts was a paper I published in 1991 that, among other things, addressed how grizzlies in Yellowstone might be affected by foreseeable losses of whitebark pine, at the time an important high-elevation source of fat-rich food for grizzly bears [5]. The timing of this paper was unfortunate given that the U.S. Fish & Wildlife Service, egged on by the Interagency Grizzly Bear Committee, was attempting to orchestrate removal of Endangered Species Act (ESA) protections for Yellowstone's grizzly bears—the first of several unsuccessful attempts. The arguments I made in 1991 were inconvenient, especially those related to the effects of climate change. Chris Servheen, Grizzly Bear Recovery Coordinator at the time, side-stepped addressing my substantive concerns by derisively likening me to "chicken little"—a tactic of substituting labeling for rational discourse well-honed during later decades by the likes of Donald Trump.

This was the first of many subsequent encounters with systematic denial of anthropogenic climate change and its impacts by well-educated people buried in the bowels of politicized wildlife management agencies catering to the interests of political and corporate elites. I went on to become (by all indications) a thorn in the side of bureaucrats and agency researchers bent on railroading removal of ESA protections for Yellowstone grizzlies, with my claims and their counterclaims regarding matters such as impacts of climate change becoming a centerpiece of public and scientific controversies [6,7]. These contestations reached a climax during court battles surrounding unsuccessful attempts by the Fish & Wildlife Service to remove ESA protections in 2006 and 2016. Climate impacts featured in arguments during both rounds of litigation, with the Fish & Wildlife Service assiduously denying not only climate impacts on bears, but even the magnitude and potential severity of climate change itself [e.g., 8.9].

This decade's-long encounter with scientific malfeasance and trust betrayal by government bureaucrats predictably left a scar. Of course, this is my subjective experience and perspective, but it is a perspective shaped by long history and my own burial in the bowels of bureaucracy that left me with little patience for those inside management agencies who didn't seem to have a moral compass, courage, or capacity for self-reflection [e.g., 10].

Since retiring from academic and government service in 2013, I've expressed myself regarding grizzly bear conservation and other matters in several essays featured on *Grizzly Times*, a web site pioneered by my wife, Louisa Willcox. The two essays featured here are updated and revised versions of blogs I posted in 2018 and 2019 featuring the effects of climate weirding on grizzly bears and people. These essays strive to serve several purposes, including persuasion of those who are amenable to persuasion, as well as expression of angst in a world that seems to be indifferent to the crises we inhabit. Hopefully this introduction provides some context for my, at times, seeming stridency about a matter that strikes me as the existential issue of our times—not only for grizzly bears, but also for humans.

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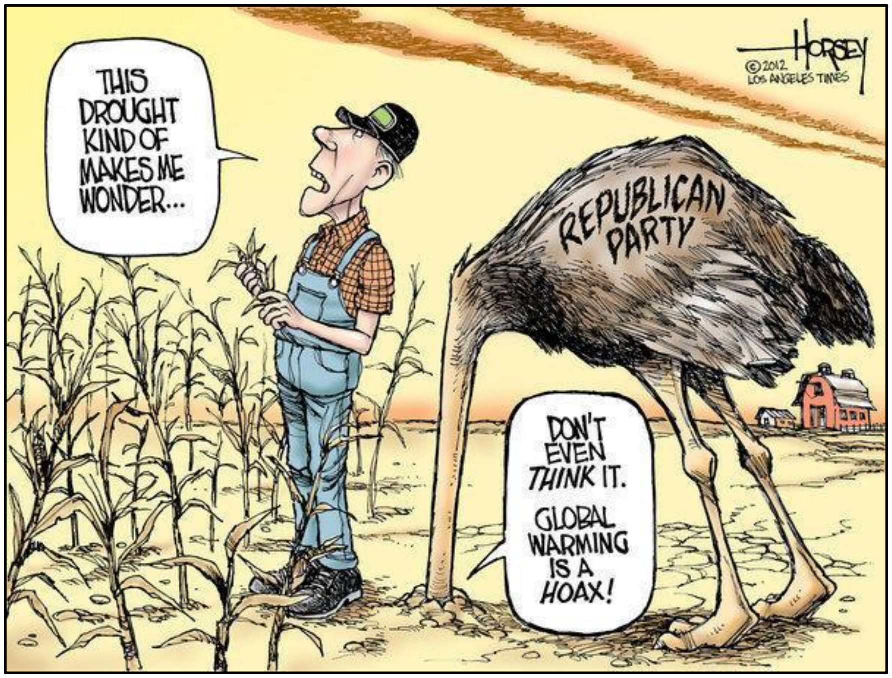
The Sinister Underbelly of Climate Warming Denial

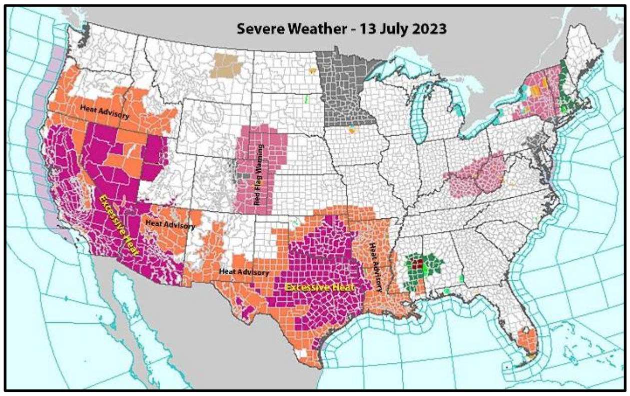
by **David Mattson**
July 2023



Earth was broiling during the first half of 2023—even more than usual. The continents of North and South America, along with New Zealand and global southern oceans, were the hottest on record for May [1]. Temperatures in the North Atlantic during April and May likewise broke records [2], spawning derivative record-breaking temperatures in the waters off Florida that exceeded 90ºF—in places even approaching 100 degrees [3]. Mind you, these were *water* temperatures.

Globally, June of 2023 held the dubious honor of being the hottest since record-keeping began [4], serving as a prelude to a brutal heatwave in the Southwest and Texas that broke all-time temperature records—in places exceeding 120ºF [5]. As I write, heat warmings and advisories encompassed all or part of 15 states, with heat indices >110-120 degrees forecast for most of these areas. Simultaneously, southern Europe was subject to an onslaught of record-breaking temperatures—a so-called Cerberus heatwave—with the ground in most parts of Spain exceeding 140ºF [6]. It's not surprising that the three hottest days ever recorded on Earth, dating back at least to the advent of temperature-measuring instruments, occurred during early July of 2023 [5].

Meanwhile, areas farther north in the U.S. had been smothered since May of 2023 in smoke from unprecedented wildfires burning in Canada that by then had already consumed a mind-boggling 20-million acres—roughly 1200% of normal for the date [7]. Siberia was likewise experiencing an epic wildfire season spawned by drought and its worst heatwave in recorded history [8]. Parts of the taiga that normally experience balmy daytime temperatures in the 70s were breaking the 100-degree mark. And the fire season had only begun.



But even this does not begin to do justice to the onslaught of news during the first two weeks of July 2023 reporting unprecedented heat, drought, wildfires, choaking air, floods, coral bleaching, ocean acidification…and more.

Meanwhile, the northern Rocky Mountains, where I live, basked in near-normal June temperatures while being bathed in near 200% of normal rainfall—a factoid that was seized upon by people invested in denying the reality of human-driven climate warming.

Climate Warming is Real

But climate warming is real, as is the role of humans. All the recent weather patterns we've been experiencing—locally, as well as globally—are precisely what climate scientists have predicted will accompany climate warming. Extremes will amplify, especially of heat, storms, seasonal precipitation, and drought. But these extremes will be—and have been—piggy-backed on a steady increase in average annual and seasonal temperatures going back to the 1980s, with increases greatest for minimum daily temperatures [9].

I am in good company when I invoke this evidence and unambiguously assert the reality of climate warming. Contrary to the claims of conservative demagogues, there is near unanimity about the reality of human-driven climate warming among scientists who have studied climate and climate change. In fact, more than 99% of such scientists agree about this fact [10]. And to claim that such consensus is the result of a conspiracy requires either well-nurtured ignorance about the nature of scientific inquiry or highly disturbing and deeply sinister motives. Yet roughly 30% of Americans don't believe that climate warming is happening or that recent weather extremes are ultimately attributable to human activities [11].

Interestingly, this is roughly the same percentage of American adults who have offered Donald Trump their unwavering political support. I will return to this consilience later.

How Can This Be?

Scientists of all sorts, but especially those studying climate, are confounded and distressed by the fact that there are so many doubters among American adults, and that so many more, even among believers, dismiss the consequences of unfolding climate change and are unwilling to make the radical changes needed to avert a catastrophe, not just for humans, but for all life on Earth.

How can this be?

This simple question has led to a veritable cottage industry of inquiry into the psychological, social, and political drivers of climate warming denial. After roughly 20 years of experiments and surveys, some more-or-less definitive conclusions have been reached, several of which initially surprised me. Yet the explanations offered by researchers make a disturbing sort of psycho-pathologic sense.

Drivers of Disbelief

One unsurprising result is prominent, though. People who are more scientifically literate *tend* to be more trusting of science, put more credence in a scientific consensus, and, as a result, believe that human-driven climate warming is happening [e.g., 12]. Reassuringly, this suggests that we humans are not completely irrational or craven.

But then things get interesting—even disquieting. Even when considering all sorts of psychological and social factors, it turns out that political ideology and affiliation are dominant proximal determinants of belief in anthropogenic climate warming [e.g., 12, 13, 14, 15]—not religiosity or other worldviews, attitudes, and orientations. In other words, everything else aside, political conservatives—almost all of whom in this country are self-identified Republicans—are the most committed disbelievers and, among those, the best educated are paradoxically the most strident of all [14, 16]. In other words, conservative elites who form the backbone of the Republican party are the standard bearers of skepticism. Surprisingly, they are expressly less amenable to persuasion by evidence than their more poorly educated political base. As a corollary, those who are most devoted to free-market ideologies—think conservative Wall Street tycoons and those who answer to them—are also committed disbelievers [17, 18].

But there is more that lurks beneath the veneer of political conservatism, party affiliation, and current articles of faith.

An additional ample corpus of research has shown that political conservatives are typified by a distinctive psychological profile. For one, they live in a heightened state of existential terror fueled by fear of death and alien "others" that inclines them to seek solace in hard cognitive and societal boundaries [20, 21, 22]. As a derivative, they tend to be more committed to tradition and the status quo, especially to the extent that such arrangements privilege them [e.g., 22, 23], which in turn spawns an eagerness to perpetuate the harm embedded in inequality and hierarchical social arrangements [e.g., 23, 24]. All of this is infused with a bestiary of bigotry, including sexism, racism, and ethnic narcissism [e.g., 25-30], amplified by heightened susceptibility to conspiracy theories and misinformation [31, 32].

In the United States those fitting this profile are disproportionately white males who, not coincidentally, feel increasingly beset by global dynamics enforcing a sort of inevitable leveling [33, 34].

Manipulating the Masses

This substantial body of scientific evidence allows for a judicious construction of the broader-scale social and psychological dynamics driving denial of anthropogenic climate warming:

> Educated but mostly white conservative businessmen and their political servants and allies recognize a threat to their current hold on power and wealth arising from calls to address rampant climate warming. They see those who promote alternative climate-cooling lifestyles and technologies as enemies to their existing entitlements—certainly profits and power. They are, moreover, inclined to be bigots. Being comparatively well-educated, they mobilize their fearful, bigoted, less educated, and less cognitively capable base comprised increasingly of disadvantaged white males by

> appealing to their interest in maintaining the status quo and inflaming their fear of an alien intrusive world, manifest as immigrants, liberals, and educated elites. National chauvinism also plays well [25].
>
> Onto this, conservative elites graft disbelief in climate warming and aversion to socialized health care, neither of which is axiomatic to being white, threatened, or ill-educated [e.g., 35, 36, 37]. But these revisionist agendas threaten profit-making engines benefiting established capitalist elites. Adherence to an agenda of denial and rejection then becomes part of a larger self-reinforcing and polarizing belief system within the conservative subculture that will not abide deviation [38-45].

It is not by coincidence that conservative white males, churned by similar manipulative machinery, voted in mass for Donald Trump during 2016 and 2020 [24-30]—the most egregious denier of anthropogenic climate warming to ever attain high political office. He was—also not coincidentally—the most blatant presidential spokesperson for bigotry as well as inequality, privilege, and corporate interests that we have seen in the last 80 years.

This is a bit speculative, but I am in the good company of numerous diligent scholars who have tried to make sense of ostensibly irrational, superficially inexplicable, phenomena typifying those who staunchly refuse to believe that anthropogenic climate change is happening.

Yet More Mystery

In addition to all this, there is something even more mystifying that has intruded upon the national stage, again involving the issue of anthropogenic climate warming. It involves federal government bureaucrats employed by the US Fish & Wildlife Service, charged by society with implementing the Endangered Species Act (ESA) and, through this trust responsibility, recovering and restoring imperiled species—the very sorts of people you would expect to deploy science with the highest integrity.

But they haven't.

A Brief History of Grizzly Bears

The treatment of grizzly bears by Fish & Wildlife Service bureaucrats is emblematic. Grizzlies were listed as threatened under the ESA in 1975, including the population centered on Yellowstone National Park. Shortly after this population began to register a numeric recovery from its 1980s nadir, the Fish & Wildlife Service started efforts to remove protections. Time after time they tried, and time after time they were thwarted in Court—for good reason. In a series of court dramas lasting from 2007 to 2009, Federal Judges reprimanded agency managers for egregiously mishandling—even ignoring—relevant science. Such reprimands by a Court are unusual. Almost invariably federal agencies are given deference on technical scientific matters. But in these cases, the malfeasance of agency bureaucrats was so blatant that Judges at the District and Appellate Court level felt compelled to act.

The Fish & Wildlife Service made another effort to remove ESA protections from Yellowstone grizzly bears beginning in 2013. This time round, the effects of climate warming were in much greater focus because of possible direct or indirect effects on bear foods and bear behaviors—recent and foreseeable. Much to the amazement of every outside scientist, the Service concluded in a final 2016 rule removing ESA protections—since reversed by federal courts—that climate change had never and would never have detrimental effects on this isolated and relatively small population of bears [46].

Yes, Fish & Wildlife Service, Climate Change is Real

By 2013 climate warming had already harmed Yellowstone's grizzly bears, with more harm promised for the future. Three of four critical bear foods had suffered major if not catastrophic declines, with the fourth forecast to nearly disappear during the next 75 years, all directly or indirectly attributable to climate warming. By contrast, there were no foreseeable positive changes on the climate-warming horizon.

More specifically, by 2016 we had lost roughly 70% of seed-producing whitebark pine in a single decade due to an outbreak of bark beetles unleashed by increasing warmth. Spawning cutthroat trout had been functionally extirpated as a bear food by a combination of predation from non-native lake trout and deteriorating hydrologic conditions, the latter driven by climate change. Elk populations had declined substantially—in instances to near local extirpation—partly because of deteriorating summer range conditions, in turn caused by increasing late-summer drought. And the last of the four key foods, alpine-dwelling army cutworm moths, was almost certain to largely disappear from the high country with projected 90% losses of alpine habitats during the next century. (For more on all of this, see [47]).

In the wake of these losses, Yellowstone grizzly bears were increasingly turning to eating human-associated meat that drew them into conflict with people and eventual near-certain death [48]. As a result, retaliation for livestock depredation and close encounters with elk hunters had become the most common causes of mortality for grizzlies in this ecosystem.

Yes, climate warming is real, with dire past and prospective future consequences for grizzly bears.

Yet More Willful Denial

As with willful ignorance on the part of the conservative electorate, the willful denial of climate warming by people who are scientifically literate and presumably concerned about the environment—but buried within the bowels of a technocratic federal agency—begs for some sort of explanation. In the case of grizzly bears, an explanation is not too hard to find.

The reasons have to do with basic human motivations—primarily access to money, power, career, and privilege, but mediated by the machinery and cultures of federal and state natural resources management agencies. Ultimately, though, all roads lead back to one of two factors: the political elites who hold agency purse strings, and a hoary culture of wildlife management organized around the precepts of domination and use, shared with state politicians aspiring to gain power over grizzly bear management in Montana, Wyoming, and Idaho.

The power of the purse is a well-established phenomenon in human affairs. Conservative politicians from states in the Northern Rockies have a long history of manipulating the budgets of agencies such as the Fish & Wildlife Service to achieve conservative ends, leading, ultimately, to an internalized aversion among upper-level Service bureaucrats to antagonizing these elites—a sort of aversive conditioning. As a result, the toxic narrative of climate warming denial has subtly insinuated itself into the very precepts of decision-making by agency employees, even among those who would otherwise be inclined to credit anthropogenic climate change, but at the same time value having career prospects and a decent paycheck.

The ethos of domination and use amplifies all these dynamics by naturally aligning with a conservative worldview and with the interests of those who, in the end, value wildlife such as grizzly bears primarily for opportunities to kill them. The impulse to kill is reflected in the primacy of sport hunting among wildlife managers pretty much everywhere. In somewhat complex ways, all of this translates into a natural sympathy, even within federal agencies, for state-based wildlife management. But more importantly, the domination-use worldview creates a powerful impulse on the part of state managers and their political allies to wrest power over wildlife management away from the federal government, in this case, ESA-based authority by the Fish & Wildlife Service over grizzlies [for more on these dynamics see [49]).

As with the impetus for those invested in climate-warming-denial more broadly, bureaucrats in the US Fish & Wildlife Service and state wildlife management agencies have fallen prey to internalized impulses organized around maintaining status quo arrangements—including their career prospects—in defiance of emerging threats organized around fundamentally different values, worldviews, and constituencies…or, simply, contestation of bureaucratic authority.

An Inescapable Imperative

The fundamental mechanisms of climate warming are not Rocket Science. The basic chemistry and physics of green-house gases and possible effects on climate had been worked out by the mid-1800s. The evidence of climate warming is, moreover, amply evident for anyone who has eyes to see it [e.g., 50]. I've witnessed inescapable manifestations even during my lifetime. For one, nighttime temperatures are not as consistently cool. As a youngster in the Black Hills, nighttime frost was pretty much guaranteed any time daily high temperatures were in the 60s. Not anymore. The aspen groves where I grew up are also dying out, following in the wake of paper birch. Both species are tracking the demise of a cooler wetter climate.

Likewise, the implications of rising CO_2 levels were known to even the least prescient of the scientific community as early as the 1970s and 80s—even implications for wildlife such as grizzly bears. I co-authored papers published in 1986 and 1991 [51, 52]—over 30 years ago—in which the problem of climate warming for Yellowstone grizzly bears was flagged. Yet, emblematic of deeply internalized climate-warming denial in the Fish & Wildlife Service, the Service's Grizzly Bear Recovery Coordinator at that time likened my concerns to those of "chicken little." Not by coincidence, this same Coordinator authored the 2007 and 2016 Fish & Wildlife Service rules that dismissed the threat of climate warming and lifted ESA protections for Yellowstone's grizzly bears. Climate-warming denial does, indeed, have deep roots, as do the cultural and political dynamics spawning it.

But all of this is rendered trivial in comparison to our unfolding reality and what it promises for life on Earth. I recently read an engaging book by Peter Brannen entitled "The Ends of the World" [53]. Much of the book is devoted to describing and explaining the causes and consequences of Earth's past mass extinctions. It is a sobering read, and a guide to what humanity's obsessive consumption of fossil fuels promises to spawn. As it turns out, rapid increases in concentrations of CO_2 and methane triggered most of the near sterilizations of Earth that occurred during the last 500-million years. Alarmingly, our current discharge of CO_2 into the atmosphere is more breakneck than during any previous mass extinction. The implications are stark, and not just for grizzly bears.

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Through the Climate Looking Glass into Grizzly Wonderland

by **David Mattson**
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Grizzly bear researchers and managers in the Northern Rockies seem to have integrated a faith-based version of climate-change-denial into their collective world view. In fact, these ostensibly well-educated men and women bring to my mind well-schooled ecclesiastics professing a belief system: "Grizzly bears are omnivores. Grizzly bears are adaptable. Grizzly bears are unaffected by changes in habitats and foods. Climate change has not affected grizzly bears. Climate change will not affect grizzly bears" [e.g., 1]. In 2016 the US Fish & Wildlife Service went so far as to baldly assert "…ever," which is, needless to say, a very long time [2].

Or, alternately, an image comes to mind of grade-schoolers sitting rigidly at attention reciting their multiplication tables, only, in this case, the recitation is: "Two times two equals four. Three times three equals six. Four times four equals eight…" There is a certain superficial logic that nonetheless subverts the precepts of arithmetic.

With perhaps a bit more disingenuousness, researchers on Yellowstone's Interagency Grizzly Bear Study Team routinely dissemble: "We looked really hard to find any effect of climate change on grizzly bears but just couldn't find any. In any case, we found that grizzlies eat more than 200 different foods" (e.g., 3,4]. A conclusion, it turns out, that is not a result of studious independent-minded inquiry, but rather the outcome of poorly designed, inadequately conceived, and largely unreplicable science.

All of this is a problem, especially for those of us who look for fact rather than fiction and faith as a basis for crafting and fulfilling public policy—including in our treatment of grizzly bears.

A Corrective for the Rhetoric

Despite Trump's record-breaking efforts to substitute fiction for fact, I can only hope that the truth still matters to most people. Based on this perhaps blithe hope, a corrective to the climate-change-denial rhetoric of grizzly bear researchers and managers is warranted. With this purpose in mind, what follows are my thoughts, point by point, in response to the government mantra:

Grizzly Bears are Omnivores, But…

Grizzly bears are omnivores, but as with all omnivores, including humans, this does not mean that they fare well on all foods. As it turns out, the digestibility and nutritional quality of bear foods vary by an order-of-magnitude [5]. A salad does not equal a steak. Moreover, bears, like humans, need a balance of energy and nutrients, which means that an endless diet of either steak or blueberries can be problematic in its own right [6-8].

Grizzly Bears are Adaptable, But…

Grizzly bears are adaptable, but not infinitely so. There are real-life consequences for their survival and reproduction depending on what, when, and where foods are available, especially vis-à-vis people, who kill roughly 80-90% of all the adolescent and adult bears that die, but also vis-à-vis other bears, that routinely kill cubs and compete for food [e.g., 9-13].

Grizzly Bears are Affected by Habitats and Diets

Grizzly bears *are* affected by changes in habitats and foods. At the risk of being repetitive, omnivory does not make them immune to changes in food quality and quantity, nor does "adaptability" make them immune from the human- and bear-related hazards associated with eating certain foods in certain areas.

Evidence for this can be found in the fact that rates and causes of bear deaths have changed dramatically in the Yellowstone ecosystem as a direct result of shifts in distributions and diets, driven by changes in food availability (e.g., whitebark pine, cutthroat trout, army cutworm moths, elk, and bison)—in turn driven by wildfires (whitebark pine), drought (elk), pathogens (whitebark pine and trout), sport harvests (elk), perverse politics (bison; e.g., 14), and invasions of non-native species (whitebark pine and trout, again).

More conclusively, the profound effect of habitats and diets is evident in order-of-magnitude differences in densities of grizzly and brown bears worldwide, unambiguously rooted in the quality, quantity, and distributions of foods [15, and see Supplemental References 1].

Grizzly Bears Have Been Adversely Affected by Climate Change

Grizzly bears have been affected by climate change. Our most conclusive evidence comes from the Yellowstone ecosystem where some dietary staples have already been driven off the menu by climate change, with resulting deleterious changes in bear behaviors.

Whitebark pine has been functionally eliminated in most parts of the ecosystem as a result of bark-beetle-caused mortality unleashed by climate warming in the pine's formerly frigid haunts [16]. Cutthroat trout have been devastated by predation from a non-native predatory fish—Lake trout—

but with the effects of this predation compounded by deteriorating hydrologic conditions in streams used by cutthroat trout to spawn [17]. Elk herds have declined, even plummeted, from a lethal brew of stressors that include deteriorating range conditions during late summer caused by climate warming [18]. Increased predation by grizzly bears on elk calves has exacerbated negative trends [19]. Notably, much of this predation by bears is probably compensatory for losses of cutthroat trout and whitebark pine [19].

Compounding problems for the grizzlies, their quest for dietary alternatives has led them to more often contest elk carcasses with hunters during fall and scavenge or prey on livestock during summer [20]. The rates at which hunters, ranchers, and managers kill grizzlies have consequently skyrocketed in lock step with increased depredations on livestock and close encounters with hunters in the backcountry. Mothers, moreover, are losing more cubs to predatory males as they turn to eating more meat to compensate for losses of especially whitebark pine, which was historically a disproportionately important food for females [21,22].

Nearly all these dynamics are, in fact, rooted in the recent but comparatively minor 1.6ºF post-industrial-revolution warming of our climate, most of which has occurred since the mid-1970s [for more on the past impacts of climate change on *Ursus arc*tos see Supplemental References 2].

Grizzly Bears Will Be Adversely Affected by Future Climate Change

Grizzly bears will, moreover, be affected by future climate change. Wildfires will become even more frequent and extensive [23-25]. Whitebark pine will be doomed to functional extirpation [26-28]. Berry-producing shrubs will be diminished—some species dramatically so [29,30]. Pollinators needed for fruit-set will continue to tank [31,32]. Tundra flowers that concentrate army cutworm moths in alpine talus slopes, where grizzlies currently consume them, will almost totally disappear. Drought, earlier snowmelt, and the continued spread of invasive species will continue to compromise any prospects for recovery of cutthroat trout [33-36]. Elk populations will likewise be affected by evermore prolonged and severe droughts…*ad nauseam*.

At the same time, species that are blithely invoked by dangerously ignorant bear biologists as the presumed replacement for food-sources we stand to lose are either unidentified, of lesser quality, or, as in the case of Gambel oak, unlikely to colonize emerging suitable habitat at a pace even close to that at which we lose extant foods [37-39]. As Ken Cole, a friend of mine put it, this factor alone guarantees that we will be living in a world of weeds 100 years from now—if not sooner [e.g., 40].

And all of this is forecast to transpire within a blink of the eye—the next 70 to 100 years—which will be only a first installment of the consequences arising from temperatures likely to broil the Earth a mere 300 or so years from now [41; for more on prospective future impacts of climate change on bears and bear foods see Supplemental References 3].

Yet More Government Dissembling

I recently reread a publication from 2010 reporting on the outcome of a workshop comprised of grizzly bear biologists assembled by the (then) USFWS Grizzly Bear Recovery Coordinator, Chris Servheen, together with a functionary of the Wildlife Conservation Society, Molly Cross, to render their purported expert opinion on how climate change would affect grizzlies [42]. I personally know all the twelve assembled bear biologists. None are or were experts on climate change. Only one had studied any aspect of linkages between changes in habitats driven by climate change and potential responses by grizzly bears or grizzly bear populations. Most were apologists for the status quo. Two were near-professional nay-sayers of the threat posed by climate change, including the USFWS Recovery Coordinator and, Chuck Schwartz, the single biologist from Yellowstone.

There are a few worthwhile nuggets scattered throughout the report, including recognition that changes in habitat could trigger dietary changes that reconfigured exposure of grizzlies to humans, with resulting effects on levels of conflict. But the report is largely populated with platitudes, most prominently that grizzlies are "adaptable omnivores." There were some evident glimmerings of intelligent life, all apparently crushed under the steamroller of political expediency and the common denominator of assembled peers.

This report, together with a single research paper published by Alberta researchers in 2014 [43], became the basis for the USFWS claiming in 2016 that climate change "had not been" and "would never be" a threat to grizzly bears [2]—more specifically those in Yellowstone where, ironically, the best evidence for effects of past climate change can be found. Parenthetically, the 2014 publication [43] modeled prospective changes in distributions of plant foods for Alberta grizzly bears, concluding, tritely enough, that some would decline and others would increase. Curiously—or perhaps not—little or no consideration was given to order-of-magnitude differences in food quality, the complicating facet of colonization rates, or, in the case of berry-producing shrubs, fates of pollinators.

The paradigm seems to be: Feature uncertainty, assume the best, and then deal with the predictable worse-case scenario after most options have evaporated. Clearly, a little information filtered through ample arrogance leavened by enthusiastic extrapolation into the realm of ignorance yields an inane outcome.

A Permian Parable

This amalgam of ignorance, indifference, and even willful denial has left me struggling for an equanimous response, especially given that we face a patently human-driven cataclysm threatening not only grizzly bears, but also most of life on Earth.

Apropos, I recommend that anyone with even a modicum of interest read about the end-Permian extinctions—notably in Peter Ward's "Under a Green Sky" [44], Peter Brannen's "The Ends of the World"[45], and related scientific publications [see Supplemental References 4]. The Permian-Triassic extinctions around 252-million years ago are the most catastrophic of any since the emergence of multi-cellular life, accounting for the demise of an estimated 80-95% of species that existed at that time. More than any other, this extinction event brings home the defining role of atmospheric chemistry in shaping life on Earth.

Relentless end-Permian eruptions of massive flood basalts from the Siberian Traps spanned roughly 900,000 years and spewed gigatons of SO_2 and CO_2 into the atmosphere, causing acid rain, depletion of the ozone layer, and rapid climate oscillations that ultimately settled into global warming culminating in an increase of around 16-22^{o}F. Warming oceans stopped circulating and became increasingly hypoxic, allowing for the proliferation of sulfate-reducing bacteria and the thaw of abyssal frozen methane hydrate that was then released in a prolonged massive belch—leading to yet more warming compounded by the depletion of atmospheric oxygen as plant life died.

Our Current Plight

There are more than a few alarming similarities between what happened 252-million years ago and what's happening now, noting first, that our global temperature baseline is 57°F [41], not that different from the Permian baseline of 64°F. Our global temperatures will likely increase by at least 3.6°F during the next 70 years [41]. However, given that we have blown by every conservative estimate for the rapidity of warming and CO_2 proliferation [46,47], we are likely headed for what is called a "hothouse scenario"—yielding temperature increases of around 7-14°F [48]. During the next three centuries, global temperatures will likely warm an additional 4-11°F, culminating in a total increase of around 18°F.

Lest you weren't keeping track, an increase of this magnitude is comparable to what happened during end-Permian times, but at a rate >500 times faster. Atmospheric heating of this combined magnitude and rapidity has never been recorded in Earth history, at least since the advent of multicellular life or perhaps in the immediate aftermath of a catastrophic asteroid impact.

Already the symptoms are multiplying. Rapidly melting ice sheets together with warming and acidifying ocean waters have bleached massive tracts of coral, slowed ocean circulation, and led to a proliferation of hypoxic "dead zones," including along the Oregon and Namibian coasts [e.g., 49-55]. Jet streams are becoming stuck as atmospheric circulation slows, resulting in ever-more frequent extreme weather [e.g., 56-58]—including, as I write, record-breaking hot June and July temperatures in southern Europe and the United States [59-61]. Over a million species are on the precipice of extinction. And this is only the beginning [e.g., 62-65].

Let Us Not Talk Falsely Now

Meanwhile, bear biologists sit around drinking coffee, pontificating about the insignificance of climate change, or exert themselves writing rules that lessen protections for grizzly bears, attesting to the presumed non-effects of climate warming—as did Chris Servheen, our past Grizzly Bear Recovery Coordinator. Perhaps charitably, their heads are in a place "…darker'n a black steer's tookus on a moonless prairie night" (*The Stranger* in *The Big Lebowski*). Less charitably, they could be viewed as aiding and abetting a crime.

Encouragingly, a recent status review by the U.S. Fish & Wildlife Service for grizzly bears in the contiguous United States [66] concluded: "…under the plausible future conditions discussed in the Species Status Assessment, the grizzly bear in the lower-48 States as a whole would be less likely to withstand plausible stochastic events, catastrophic events, or retain sufficient adaptive capacity to withstand environmental change 30 to 45 years into the future." This conclusion is cause for very cautious optimism about the judgment and ethics of people in the Fish & Wildlife Service charged with protecting our grizzly bears.

Regardless, we humans are probably destined for the scrap heap of evolution unless we speedily sequester massive amounts of carbon, transition to carbon-neutral energy production, and institute effective worldwide birth control [67]. The rapid emergence of a highly lethal and communicable human disease would also probably benefit other life on Earth. Of these, the last seems the most likely to happen [68], especially given the havoc wrought the comparatively benign COVID-19 virus.

Perhaps at a minimum, we can approach management and conservation of our threatened grizzly bears in a more enlightened, responsible, and humble manner. As Bob Dylan so eloquently sang in *All Along the Watch Tower*, "…let us not talk falsely now, the hour is getting late."

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