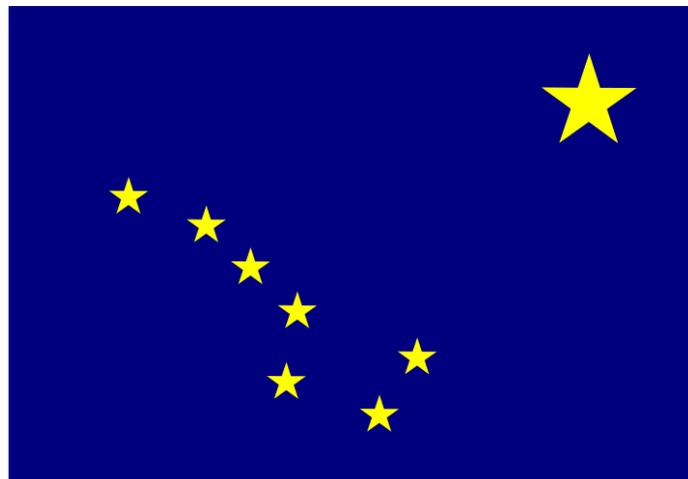


OBSERVED CLIMATE CHANGE AND THE NEGLIGIBLE GLOBAL EFFECT OF GREENHOUSE-GAS EMISSION LIMITS IN THE STATE OF ALASKA

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Summary for Policy Makers

The climate of Alaska has changed considerably over the past 50-plus years. However, human emissions of greenhouse gases are *not* the primary reason. Instead, the timing of the swings of a periodic, natural cycle—the Pacific Decadal Oscillation (PDO)—has made a strong imprint on the observed climate of Alaska since the mid-20th century. Despite its established existence and influence, this natural cycle is often overlooked or ignored in zealous attempts to paint the current climate of Alaska as being one primarily molded by the emissions from anthropogenic industrial activities. In truth, the climate of Alaska and the ecosystems influenced by it have been subject to the cycles of the PDO and other natural variations since the end of the last ice age (some 12,000 years ago) and likely for eons prior. It is primarily these natural cycles that are currently shaping Alaska’s long-term climate and weather fluctuations.



Local and regional processes are the most important determinants of the climate experienced by local and regional ecosystems, including human populations. Global-scale influences are much harder to detect and their influence on regional-scale changes is uncertain. In fact, global climate models which project changes in future climate are unable to reliably model local and regional changes—the most important ones in our daily lives.

Therefore, efforts to control global processes through local changes are largely useless when it comes to the climate. For instance, the greenhouse gases emitted by human activities each year in the state of Alaska amounts to less than 0.2 percent of the global total human greenhouse gas emissions. Industrial growth in China adds an additional Alaska’s worth of carbon dioxide into the atmosphere each and every month (over and above its baseline emissions). This leads to the inescapable conclusion that even *a complete cessation of all* carbon dioxide emissions originating from Alaska would be subsumed by global greenhouse gas emissions increases in less than *three week’s time*. What’s more, carbon dioxide emissions reductions in Alaska would produce no detectable or scientifically meaningful impact on local, regional, or global climate. Unfortunately, the same cannot be said for the economic consequences of greenhouse gas emissions’ legislation—they have been recently estimated to be large, and negative, for the citizens of Alaska.

Alaska’s Climate and the Pacific Decadal Oscillation (PDO)

The primary driver of the swings and short-term trends in Alaska’s climate is a natural, cyclic, phenomenon known by atmospheric scientists as the Pacific Decadal Oscillation, or PDO for short. The PDO was first “discovered” and the name coined in the mid 1990s by a fisheries scientist who was investigating the historical boom and bust cycles in the Alaskan salmon industry. Steven Hare noticed that salmon production in Alaska was closely tied to climate variability in the Pacific northwest and that when salmon production was high in Alaska, it was low in Washington, Oregon, and California, and vice versa. Changes in other marine ecosystems were noticed as well.

These ecosystem changes were linked to changes in the predominant patterns of atmospheric pressure and sea surface temperatures (SSTs) in the North Pacific Ocean. “Warm” phases of the PDO (high productivity in the waters of Alaska), are associated with cool SSTs in the central North Pacific and warm waters along the northwestern coast of North America (including Alaska). Atmospheric pressure is low over the North Pacific and high over western North America—a situation which leads to greater southerly flow across Alaska, bringing in more moisture, cloudiness, and warm temperatures. The “cold” phase of the PDO is characterized by the opposite set of conditions, including colder than normal SSTs along the Alaskan coast, and drier and colder conditions. Each “phase” of the PDO, as the name suggests, usually lasts for several decades on end (Mantua, 1999).

Sea Surface Temperature and Wind Flow Patterns and PDO Phases

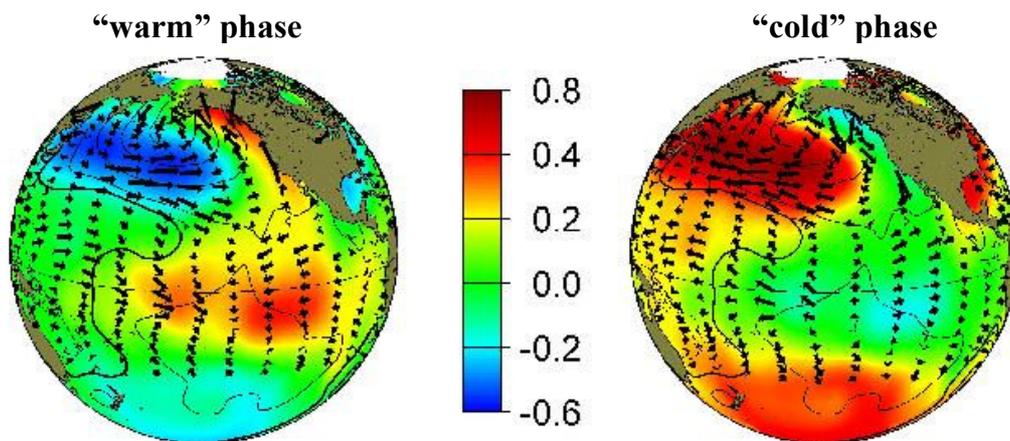


Figure 1. The typical sea surface temperature and wind flow patterns associated with the “warm” phase of the Pacific Decadal Oscillation (left) and the “cold” phase (right) (source: <http://jisao.washington.edu/pdo/>)

The observed history of the climate across the North Pacific shows that two full PDO cycles have occurred during the past century. “Cool” phases were evident from 1890-1924 and 1947-1976, and “warm” phases occurred in 1925-1946 and again from 1977 through the present. This last phase change, from cold to warm, that occurred in 1976-1977 has left a strong imprint on the climate trends in Alaska during the past 50 years or so.

Time history of the PDO

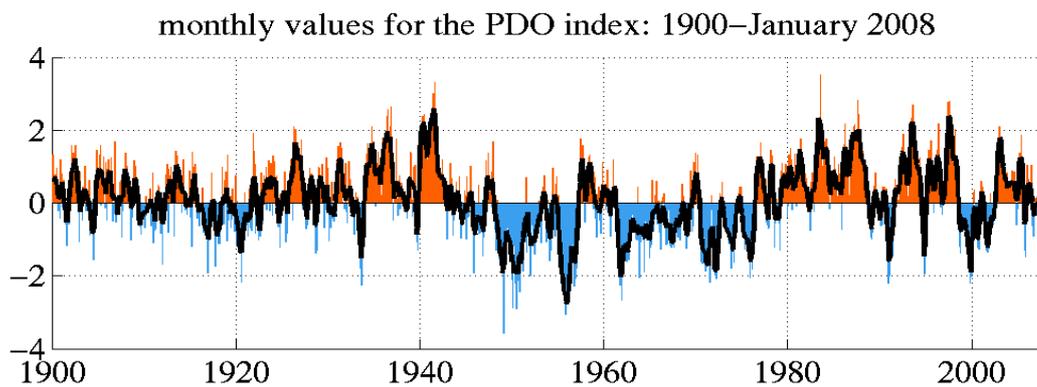


Figure 2. The history of the PDO from 1900 through 2007 (source: <http://jisao.washington.edu/pdo>).

Paleoclimate researchers have been able to reconstruct the general cycle of the PDO back even further, using a collection of “proxy” records which includes tree ring chronologies from Alaska, the Pacific Northwest, and subtropical North America as well as coral fossil from Rarotonga located in the South Pacific (Verdon and Franks, 2006). Such research demonstrates that the cycles of the PDO have been occurring long before human activity could have possibly influenced the earth’s climate and demonstrate that such cycles are part of the naturally-occurring climate variability of the region.

Reconstructed history of the PDO

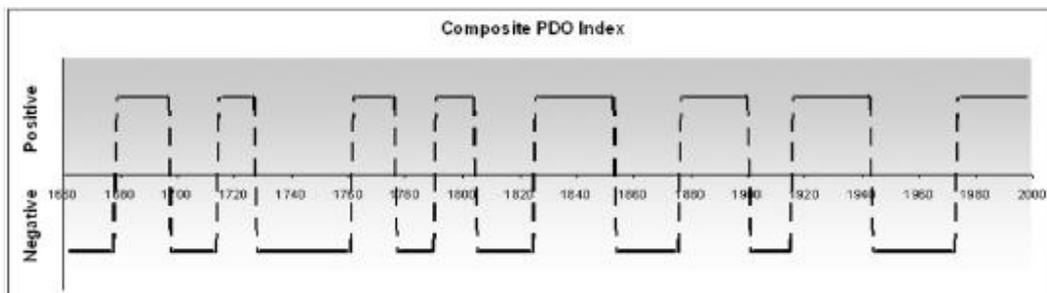


Figure 3. Duration and timing of step changes in the Composite PDO Index from 1662–1998 (from Verdon and Franks, 2006).

It is imperative, therefore, that the influence of the PDO not be overlooked when examining the trends in the climate and ecosystems of Alaska during the past few decades. The shift from the “cold” phase to the “warm” phase of the PDO (1976-1977) dominates the record. In Alaska, there has not been a “trend” in the climate during the past 50 years as much as there has been a step change fully ascribable to the natural PDO.

Alaska Temperature History

The influence of the PDO on Alaska’s climate makes trend analyses of climate variables difficult to interpret and often time leads to inappropriate conclusions and policy responses. This influence is no more strongly evident than in the state’s temperature history.

According to the analysis from the Alaska Climate Research Center, there has been considerable warming at locations across the state from 1949 to 2007, the period when the best records are available.

Total Change (°F) in Mean Annual Temperatures across Alaska, 1949-2007

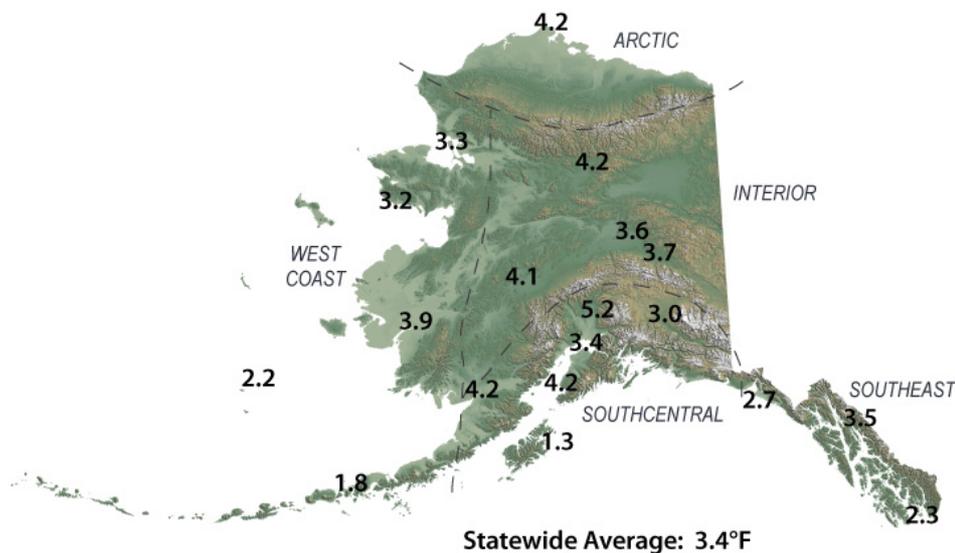


Figure 4. Total change in annual mean temperature at various locations across Alaska, 1949-2007 (source: Alaska Climate Research Center).

When the temperature records for the individual sites are combined into a single, statewide average, the nature of the temperature history of Alaska is readily evident—instead of a steady warming trend, a step-like change from relatively cooler conditions to relatively warmer ones occurred in 1976-1977. This step change is not the type of change projected to occur from an increasing anthropogenic greenhouse gas enhancement. Instead, it is reflective of the natural PDO flipping from one state to another. The change from the cold phase of the PDO to the warm phase in 1976-1977 generally resulted in an increase flow of warm, moist, southerly air into Alaska and, consequently, higher temperatures.

Alaska Statewide Mean Annual Temperatures Anomalies (°F), 1949-2007

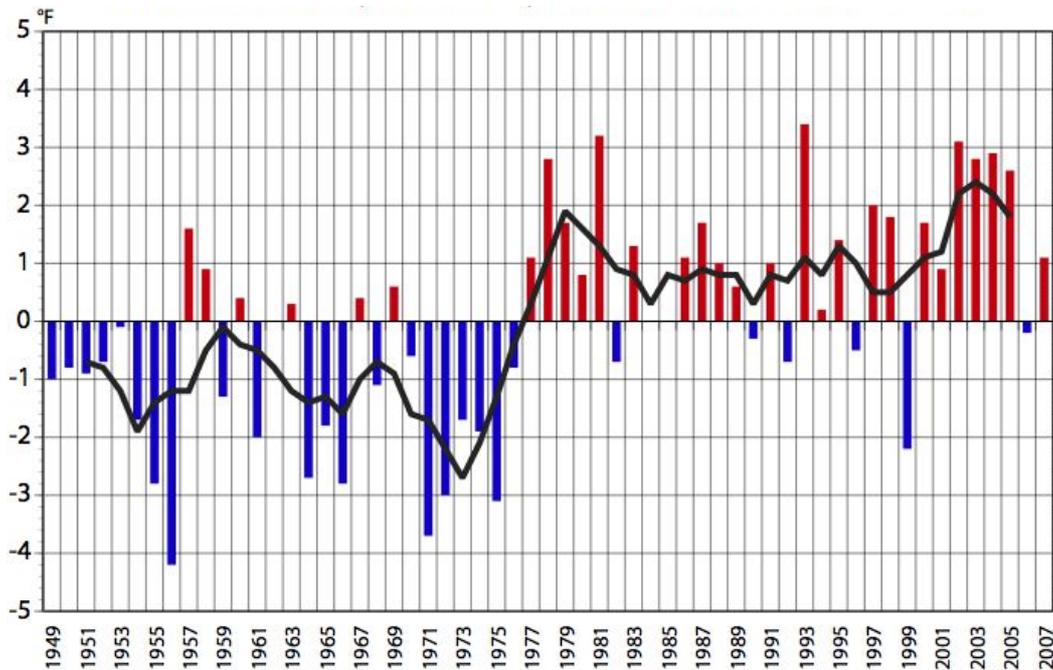


Figure 5. Alaskan statewide average temperature, 1949-2007 (source: Alaska Climate Research Center). Note the step-change in Alaska temperatures in late 1970s coincides with the step-change from the cooling to the warming phase of the PDO (see figure 3).

In fact, there has been no overall change in Alaskan statewide average temperature since the step change in 1976—another indication that anthropogenic “global warming” which has presumably been strongest during in recent decades is not a significant determinant of the state’s recent temperatures.

Alaska Statewide Mean Annual Temperatures Anomalies (°F), 1977-2007

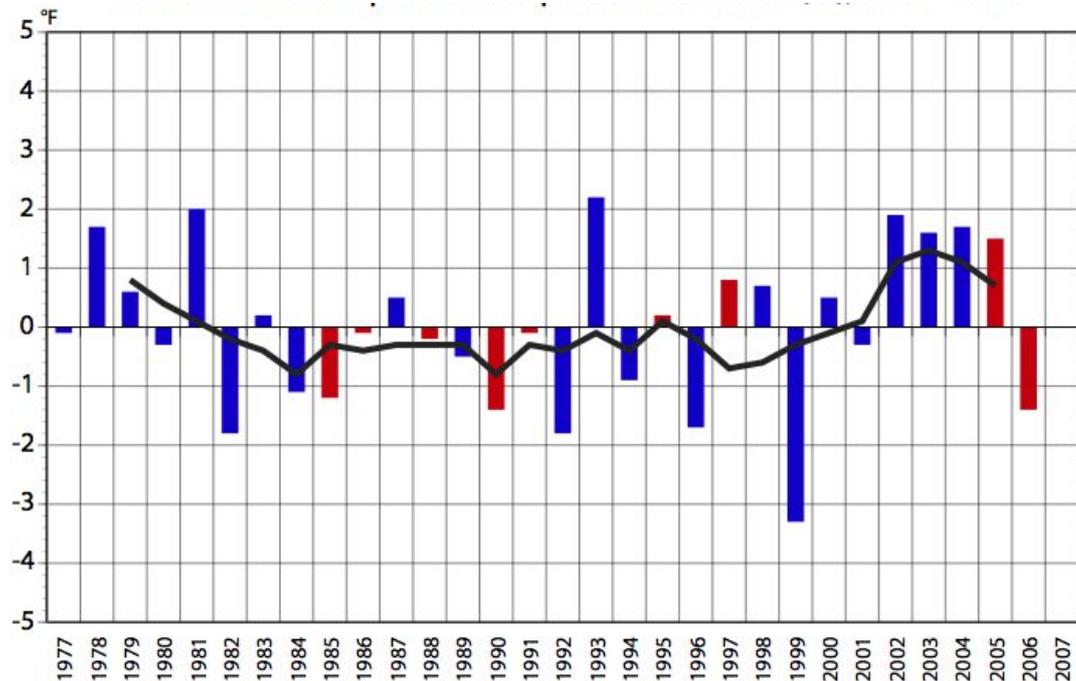


Figure 6. Alaskan statewide average temperature, 1976-2007 (source: Alaska Climate Research Center).

Other Impacts of the current PDO warm phase

Accompanying the shift from the cool PDO phase to the warm PDO phase in 1976-1977 was a variety of climate and ecosystem changes across Alaska similar to those during the warming of the 1930s. In addition to rising temperatures, there was an increase in cloudiness, more frequent and intense storms and a northward shift in the predominant storm tracks (Hartmann and Wendler, 2005). These natural climate changes led to many of the “impacts” that some people associate with anthropogenic “global warming.” Such impacts include changing ecosystems, melting permafrost, retreating glaciers, and receding shorelines. While, observations reportedly confirm that these types of changes are occurring as the climate of Alaska has become warmer, what they don’t indicate is what is behind the altered climate. In the case of Alaska, it is not so much anthropogenic activity as it is the natural cycles of the PDO.

In most cases, the events occurring currently are not unique to the past few decades, having been observed or deduced to have taken place many times in the past as part of the state’s natural climate.

In recent years, seemingly every weather event or climate trend is alarmed as evidencing disastrous human-caused “global warming;” many of the changes resulting from natural cycles in Alaska are exhibited as global warming case and point. Closer scrutiny shows nothing could be further from the truth.

Relocating Native Villages

One story which shows up in the news from time to time revolves around the plight of native Alaskans—specifically, that some Inuit coastal villages are being threatened by an encroaching sea.

Yet, the Alaskan shoreline has long been known to be unstable and vulnerable to strong storms (and the warm phase of the PDO makes such storms more severe and more frequent).

For instance, an intense storm struck the northwestern tip of Alaska during the fall of 1963. This storm caused over 3 million dollars in damage, primarily to the U.S. Government research camp that was located at Barrow, Alaska. This storm produced 55mph winds (gusting to 75mph) and waves topping 10 feet, pushing a storm surge over the 10-foot high protective beach. The storm hit during an unusual ice-free period in early October—the primary reason why the seas grew to such damaging heights. During most months there, near shore sea ice coverage is sufficient to dampen (or prevent entirely) the build up of significant wave heights. James Hume and Marshall Schalk, described the damage from the 1963 storm in an article written for the journal *Arctic* in 1967. Based upon historical weather records and the recollection of Inuit elders, they reckoned that the storm was about a “200 year” storm.

The wind and waves from the great 1963 storm took a toll on the Barrow shoreline. Hume and Schalk estimated the erosional damage from the 1963 storm to be equivalent to about 20 years work of “normal” erosive processes. The “normal” erosive processes themselves were known to be quite high along much of Alaska’s coast, which is made up of loose sediments held together by ice. Erosion rates were measured to range from a few feet to tens of feet per year along much of Alaska’s western and northern shorelines (MacCarthy, 1953; Hume et al., 1972; Hartwell, 1973; Lewellen, 1977; Harper, 1978).

The 1963 storm, and others like it, should have served as ample warning against settling on the unstable Alaskan coastline. Instead, today there are repeated reports of recently-established native villages having to be moved inland because of an encroaching ocean—and the culprit is always reputed anthropogenic global warming, never lack of foresight.

Understandably, as the native Alaskans began a transition from their traditional nomadic lifestyles to more permanent villages, replacing snowhouses with tin and plywood buildings, dogsleds with snowmobiles, and seal oil lamps with electric lights, many of these settlements were located very near (the already-receding) shoreline to provide ready access to the oceans, a primary source of the coastal Inuit's sustenance. But as the processes leading to shoreline erosion have continued and perhaps even intensified, the ocean has begun encroaching on the Inuit settlements—a situation which today has become a rallying cry for global warming alarmists.

In earlier times, when the Inuit were more nomadic, they simply would have broken camp and moved to a more suitable location. Such adaptation regularly occurred long before the major post-war ramp up of industrial emissions. In fact, the historical scientific literature contains references to abandoned Inuit camps located on the precipices of an eroding coast. For instance, Gerald MacCarthy, in an article published in *Arctic* in 1953 entitled “Recent Change in the Shoreline Near Point Barrow, Alaska” wrote:

At ‘Nuwuk’ [Point Barrow] the evidence of rapid retreat is especially striking. The abandoned native village of the same name, which formerly occupied most of the area immediately surrounding the station site, is being rapidly eaten away by the retreat of the bluff and in October 1949 the remains of four old pit dwellings, then partially collapsed and filled with solid ice, were exposed in cross section in the face of the bluff. In 1951 these four dwellings had been completely eroded away and several more exposed.

To a large degree, native Alaskans are transitioning to a more modern, less mobile lifestyle. But the transition has not come smoothly, which is often the case as a culture is faced with an uncertain, and oftentimes unwanted, upheaval. Establishing “permanent” settlements in a less than ideal setting is hardly a new mistake. For instance, consider the establishment of the village of Barrow, Alaska back in the 1960s. Hume et al. (1972) include the photograph below along with the caption: “Aerial view of the bluffs near the village recently settled. One building collapsed and one has been moved from the bluffs as a result of the 1968 storm. The beach formerly was 30 m. in width at this point. Photo taken in August 1969.” The authors go on to add “The village will probably have to be moved sometime in the future; when depends chiefly on the weather...”

Historical Photo of Barrow, Alaska, 1969



Figure 7. Photo from 1969 of the (then) recently established village of Barrow, Alaska showing the encroaching ocean (from Hume et al., 1972).

For many decades it has been known and reported that erosion has been eating away at the Alaska coast. Wind and waves pounding on soil held together by ice acts through a positive feedback to expose more frozen soil to the above-freezing temperatures of summer and the warm rays of sunshine, softening it for the next round of wave and wind assault. And so the process continues. A decline in near-shore ice cover helps to exacerbate the process. Ignoring these well-known environmental conditions has led to the unfortunate situation today where Inuit villages are facing an imminent pressure to relocate. Again, this situation has less to do with anthropogenic climate change than it does to poor planning in the light of well-established natural threats—threats that have existed for at least the better part of the 20th century.

Acting on top of these long-term erosive processes is enhanced storm frequency and intensity as well as the changing storm tracks that accompany the warm phase of the PDO. Hartmann and Wendler (2006), both scientists from the University of Fairbanks, describe how the atmospheric circulation patterns characteristic of the warm phase of the PDO send more frequent storms into southern and south-central Alaska. Not surprisingly, the Inuit villages identified by the Alaskan government as being the most in need of aid as a result of erosion—Newtok, Kivalina, Koyukuk, Shaktoolik, Shishmaref, and Unalakleet—are located along the southern and south central coasts. While a changing climate plays some role in the plight of

these villages, the instrument of the climate change is largely natural variation of the PDO, rather than anthropogenic “global warming.”

Wildlife Changes

Another arena where current events and trends are pointed to as being caused by anthropogenic global warming concerns wildlife patterns across Alaska.

a) Robins

One claim -- repeated by Andrew Revkin of the NY Times -- which has become a sort of urban legend is that the Inuit language lacks a word for ‘robin’—a species which has expanded its range and begun showing up in some Inuit settlements as the climate has become more favorable. As with most urban legends, this one can be proven false with even minimal investigation. Historic references, rather than alarmist word-of-mouth fantasies reveal the truth.

In an article published in 1953 titled “The Naming of Birds by Nunamiut Eskimo,” Laurence Irving of the Arctic Health Research Center of the U.S. Public Health Service in Anchorage describes his time spent among the Nunamiut Eskimo living in the Brooks Range of northern Alaska. Irving compared English names with the Nunamiut Eskimo names for the birds they encountered. Irving believes that the Eskimo names were from usage of older Nunamiut people and not recent additions. In Irving’s article, he provides the complete list of some 103 bird species. Among the list was the word for robin—“Koyapigaktoruk”—apparently a derivative of the sound of the robin’s song. Irving designates the robin’s status in the region as “NM” for “nesting” and “migrant”—not exactly a rare breed.

Irving refers to an even earlier compilation of Eskimo names for birds -- the most complete list of Eskimo bird names for this part of Alaska so far published -- that can be found in the book *My Life with the Eskimo* by V. Stefansson published in 1913. Stefansson, provides a description of robin sightings in the Canadian Arctic prior (obviously) to 1913, including along the far northern coast. Accompanying these location descriptions are the word for ‘robin’ in several other Inuit tongues, including (phonetically) “Kre-ku-ak’tu-yok” (Mackenzie Eskimo) and “Shab’wak” (Alaskan Eskimo).

So, as it turns out, there are plenty of Inuit words for robin that have existed for a long time and in languages that are spread among bands of Inuit all across the North American Arctic. Global warming has nothing to do with any of it.

B) Drowning Polar Bears

Another alarmist fabrication is that anthropogenic global warming is causing polar bears to drown as the distances they have to swim has increased due to diminishing summer ice pack. This story is favored among global warming alarmists, such as Al Gore, who represent the polar bears as cute and cuddly and which are dying as a result of American's wanton use of hydrocarbon energy.

As a British High Court judge found, this claim too, is vastly distorted.

The original source of the drowning polar bear story is a series of studies conducted by Charles Monnett and colleagues from the Alaska Region of the U.S. Minerals Management Service (MMS). MMS has been observing and counting polar bears on Alaska's north shore for the past 30 years or so as part of broader efforts to survey bowhead whale populations in the region and assess any impacts that oil and gas exploration activities may be having. Since the late 1970s, aerial surveys have been conducted from small airplanes flown during the late summer/early fall, documenting numbers of whales, polar bears, and other large marine mammals.

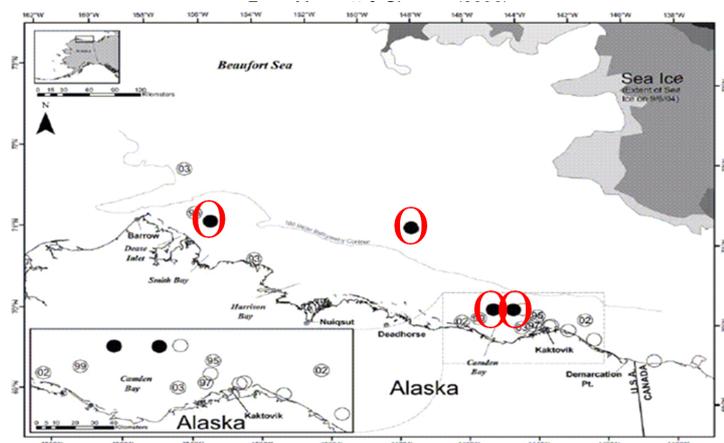
In December 2005, Monnett et al. presented a poster at the Marine Mammals Conference in San Diego (followed soon thereafter by a publication in the journal *Polar Biology* in early 2006) in which they documented a change in the patterns of late-summer polar bear sightings. During the first part of the record, polar bears were usually spotted on ice floes lying off the Alaskan coast, between Barrow and Demarcation Point, near the Alaska/Canada border. During the latter part of the record, from 1992-2005, most of the bears were spotted on land as there was little ice to be found within tens to hundreds of kilometers of the coast. Alone, these observations indicated that adaptation behavior of the polar bears was engaged as the environmental conditions around them changed. Hardly newsworthy in and of itself—polar bears adapting as best they could to climate change.

But the part of the study that garnered the press attention was that Monnett et al. reported the sighting of four polar bear carcasses floating in the sea several

Figure 8

Four dead polar bears

Monnett & Gleason, 2006



kilometers from shore, presumably having drowned. All four dead bears were spotted from the plane a few days after a strong storm had struck the area, with high winds and two meter high waves. Since polar bears are strong swimmers, the authors concluded that it was not just the swimming that caused the bears to drown, but that swimming in association with high winds and waves, which made the exertion rate much greater, sapping the bears of their energy and leading to their deaths. The authors also suggested that the frequency and intensity of late summer and early fall storms should increase (as would the wave heights) because of global warming and thus the risk to swimming bears will increase along with the number of bears swimming (since there will be less ice) and subsequently more bears will drown. But they didn't stop there—they suggested that the increased risk will not be borne by all bears equally, but that lone females and females with cubs will be most at risk—putting even more downward pressure of future polar bear populations.

But do all of these rank speculations follow from the data? There haven't been any reports of polar bear drownings in Alaska in 2005, 2006, 2007, or 2008—all years with about the same, or even less late-summer sea ice off the north coast of Alaska than in 2004, the year of the documented drownings.

In 2004 is when the researchers reported seeing four polar bear carcasses floating at sea where they had never seen any in previous surveys. To repeat, the four dead bears, coupled with 10 other bears that were observed to be swimming in open water more than 2 km from land led them to *surmise* that global warming was making the bears swim long distances and then drowning as the exertion overcame them when they got caught in a storm.

But is this really likely? This NASA web site (<http://svs.gsfc.nasa.gov/vis/a000000/a003400/a003464/index.html>) shows the minimum extent of Arctic sea ice each summer since 1979. It turns out that in many, if not most late summers, the edge of the sea ice is quite a ways from the north coast of Alaska. In fact, in the Beaufort Sea where the 4 bears were reported drowned, area sea ice there has been slowly *expanding* since 1991 (see *Figure 10*).

Thus, sea ice conditions along the northern coast of Alaska were hardly that unusual during September 2004. No more so than they were in the years since or in many years prior. So bears weren't encountering unusual ice conditions in 2004. In fact, in the period 1992-2004, more than 50% of bear sightings were in regions of no ice (Monnett et al., 2005). Why an elevated number of bears were observed swimming in open water in 2004 is unclear, but it could be from any number of reasons such as sampling error, bear population dynamics, and bear food dynamics to name a few—but an unusual expanse of open water doesn't seem to be one of them.

Arctic Sea Ice Minima, 1999-2007

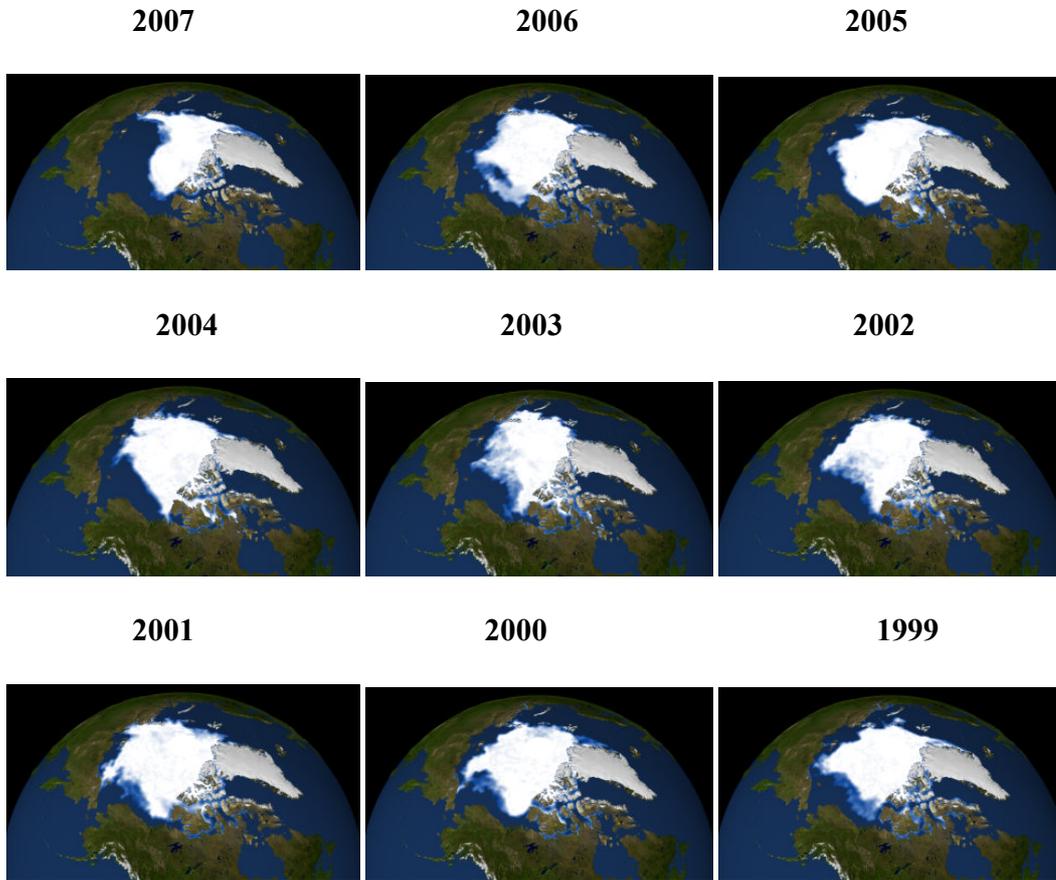
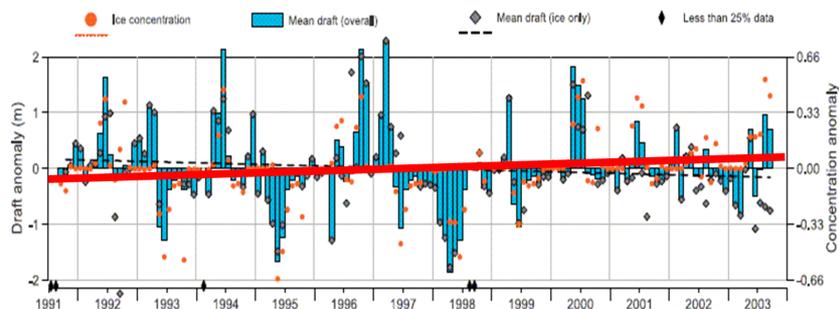


Figure 9. Extent of Arctic sea ice at time of summer minimum, 1999-2007. The edge of the sea ice pack is far from the northern Alaskan coastline virtually every summer (source: <http://svs.gsfc.nasa.gov/vis/a000000/a003400/a003464/index.html>)

Figure 10

Extent of sea ice in the Beaufort Sea 1991-2003



Simply, what was likely the sole cause of the bear fatalities was a big storm and high waves that swamped them.

What this all means is that the number of drowning polar bears is not very significant in terms of the overall population of bears, which number in the thousands in Alaska. In fact, polar bear drowning seems rare and unusual. However, as summer ice conditions off the north Alaskan coast couldn't get much worse than they were in 2007, when there was hardly any at all, and since there has been no evidence that large numbers (if any) bears drowned as a result, it would seem that death by drowning is not putting any verifiable downward pressure on the population of Alaskan polar bears.

Long-term Climate History of Alaska

Current conditions in Alaska, largely brought about by the warm phase of the PDO, are conducive to increasing the recession rate of the state's many glaciers (a recession rate first established at the end of the Little Ice Age in the mid-to-late 1800s), initiating thawing of marginal permafrost and other impacts reviewed above. Still, current conditions are not unusual in the present Holocene climate epoch (the period since the end of the last ice age about 10,000-12,000 years ago). In fact, there have been several extended periods, stretching from centuries to millennia, during the Holocene in which the climate of Alaska was warmer than it is currently.

These warm periods have been described and documented in the scientific literature.

In one such paper titled "Pronounced climatic variations in Alaska during the last two millennia," University of Illinois scientist Feng Sheng Hu (2001) examined the make-up of lake sediments located in the northwest foothills of the Alaskan Range to determine how the climate varied during that period. Among other findings, Hu and colleagues concluded that there have been three periods of roughly similar warmth in Alaska during the past 2,000 years—periods from A.D. 0 to 300, 850-1200, and 1800 to present. Thus, the environmental changes that are occurring in the current warm period surely occurred during several other occasions in the past 2,000 years—long before human activities were having an impact on the global climate.

An even farther look back in time was summarized in a landmark study, "Holocene thermal maximum in the western Arctic," published in 2004 by 30 eminent scientists whose specialty is past climate (Kaufman et al., 2004). Making use of a variety of proxy indicators, the authors concluded that the climate of

Alaska averaged ~3°F warmer than recent times over an extended period of 2,000 years, from 9,000 to 11,000 years ago. Clearly, the early ancestors of today's native Americans as well as today's polar bears, walruses, and other plant and animal species made it through that extended warm period.

All physical evidence provides a clear picture that Alaska's climate is far from stationary. It warms and cools over time scales of years, decades, centuries, and millennia. That the human influence on the global atmospheric composition has only become possible during the past 50 years or so indicates that natural forces are the primary drivers behind these long-occurring climate fluctuations to which native flora and fauna have adapted and evolved. The climate of today is not unparalleled. It is one that has been experienced in Alaska on numerous occasions over the past 12,000 years.

Impacts of climate-mitigation measures in the state of Alaska

Globally, in 2004, humankind emitted 27,186 million metric tons of carbon dioxide (mmtCO₂), of which emissions from Alaska accounted for 47.0 mmtCO₂, or a mere 0.17% (EIA, 2007a, b). Alaska's proportion of manmade CO₂ emissions will *decrease* over the 21st century as the rapid demand for hydrocarbon energy in developing countries such as China, India, Brazil, South Africa, and Indonesia rapidly outpaces the growth of Alaska's CO₂ emissions (EIA, 2007a).

During the past 5 years, global emissions of CO₂ from human activity have increased at an average rate of 3.5%/yr (EIA, 2007a), meaning that the annual *increase* of anthropogenic global CO₂ emissions is more than *20 times* greater than Alaska's *total* emissions. This means that even a complete cessation of *all* CO₂ emissions in Alaska would be completely subsumed by global emissions *growth* in less than three week's time! China alone adds about 13 Alaska's-worth of *new* emissions to its emissions' total each and every year. Clearly, given the magnitude of the global emissions and global emission growth, regulations prescribing even total cessation of Alaska's CO₂ emissions will have absolutely no effect on global climate.

Further, Alaskan forest fires annually emit more carbon dioxide to the atmosphere than all human activity combined—a situation that is unique among the 50 states. Thus, any changes in human carbon dioxide emissions would be largely lost in the natural variations in fire activity.

In trying to determine the climatic effects of greenhouse gas emissions limitations, Wigley (1998) examined the climate impact of the adherence to the emissions controls agreed under the Kyoto Protocol by participating nations, and found that, if all developed countries meet their commitments in 2010 and maintain them

through 2100, with a mid-range sensitivity of surface temperature to changes in CO₂, the amount of warming “saved” by the Kyoto Protocol would be 0.07°C by 2050 and 0.15°C by 2100. The global sea level rise “saved” would be 2.6 cm, or one inch. Even a complete cessation of CO₂ emissions in Alaska is only a tiny fraction of the worldwide reductions assumed in Dr. Wigley’s global analysis, so its impact on future trends in global temperature and sea level will be only a minuscule fraction of the negligible effects calculated by Dr. Wigley.

CO₂ Emissions form Human Activities and Forest Fires

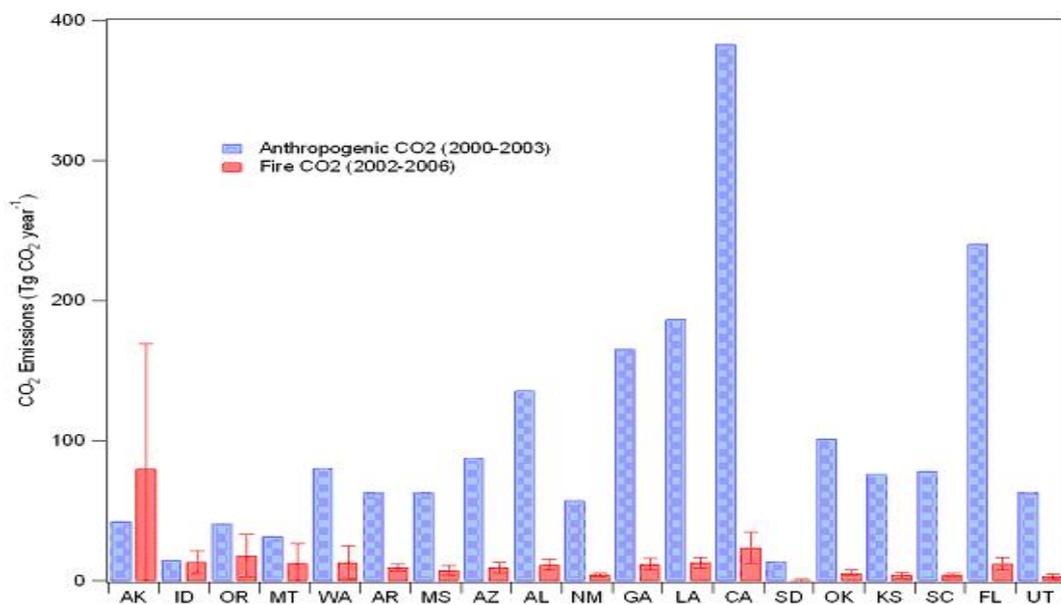


Figure 11. Annually-averaged anthropogenic emissions (2000-2003) of CO₂ and annually-averaged CO₂ emissions (2002-2006) from fires for states where average fire emissions greater than 5% of the states’ anthropogenic emissions. The error bars associated with the fire emission estimates represent the standard deviation of the monthly emissions for 2002-2006 (from Wiedinmyer and Neff, 2007).

To demonstrate the futility of emissions regulations in Alaska, we apply Dr. Wigley’s results to the state, assuming that the ratio of U.S. CO₂ emissions to those of the developed countries which have agreed to limits under the Kyoto Protocol remains constant at 39% (25% of global emissions) throughout the 21st century. We also assume that developing countries such as China and India continue to emit at an increasing rate. Consequently, the annual proportion of man-made global CO₂ emissions contributed by human activity in the United States will decline. Finally, we assume that the *proportion* of total U.S. CO₂ emissions in Alaska – now 0.8% – remains constant throughout the 21st century. With these assumptions, we generate the following table derived from Wigley’s (1998) mid-range emissions scenario (which itself is based upon the IPCC’s likely overstated scenario “IS92a”):

Table 1
Projected annual CO₂ emissions (mmtCO₂)

Year	Global emissions: Wigley, 1998	Developed countries: Wigley, 1998	U.S. (39% of developed countries)	Alaska (0.8% of U.S.)
2000	26,609	14,934	5,795	46
2025	41,276	18,308	7,103	57
2050	50,809	18,308	7,103	57
2100	75,376	21,534	8,355	67

Note: Developed countries' emissions, according to Wigley's assumptions, do not change between 2025 and 2050: neither does total U.S. or Alaska emissions.

In Table 2, we compare the total CO₂ emissions saving that would result if Alaska's CO₂ emissions were *completely halted* by 2025 with the emissions savings assumed by Wigley (1998) if all nations met their Kyoto commitments by 2010, and then held their emissions constant throughout the rest of the century. This scenario is "Kyoto Const."

Table 2
Projected annual CO₂ emissions savings (mmtCO₂)

Year	Alaska	Kyoto Const.
2000	0	0
2025	57	4,697
2050	57	4,697
2100	67	7,924

Table 3 shows the proportion of the total emissions reductions in Wigley's (1998) case that would be contributed by a *complete halt* of all Alaska's CO₂ emissions (calculated as column 2 in Table 2 divided by column 3 in Table 2).

Table 3
Alaska's percentage of emissions savings

Year	Alaska
2000	0.0%
2025	1.2%
2050	1.2%
2100	0.8%

Using the percentages in Table 3, and assuming that temperature change scales in proportion to CO₂ emissions, we calculate the global temperature savings that will result from the complete cessation of anthropogenic CO₂ emissions in Alaska:

Table 4
Projected global temperature savings (°C)

Year	Kyoto Const	Alaska
2000	0	0
2025	0.03	0.0004
2050	0.07	0.0008
2100	0.15	0.001

Accordingly, a cessation of all of Alaska's CO₂ emissions would result in a climatically-irrelevant and undetectable global temperature reduction by the year 2100 of one *thousandths* of a degree Celsius – a number is so low that it is effectively equivalent to zero. Results for sea-level rise are also negligible:

Table 5
Projected global sea-level rise savings (cm)

Year	Kyoto Const	Alaska
2000	0	0
2025	0.2	0.002
2050	0.9	0.01
2100	2.6	0.02

A complete cessation of all anthropogenic emissions from Alaska will result in a global sea-level rise savings by the year 2100 of an estimated 0.02 cm, or less than one *hundredths* of an inch. Again, this value is climatically irrelevant and virtually zero.

State CO₂ Mitigation Plans: Futility and Projected Climate “Savings”

State	2004 Emissions (million metric tons CO ₂)	Percentage of Global Total	Time until Total Emissions Cessation Subsumed by Foreign Growth (days)		Temperature “Savings” (°C)		Sea Level “Savings” (cm)	
			Global Growth	China Growth	2050	2100	2050	2100
AK	47.0	0.17	18	28	0.0008	0.0013	0.0108	0.0217
AL	140.3	0.52	53	84	0.0025	0.0037	0.0321	0.0647
AR	63.7	0.23	24	38	0.0011	0.0017	0.0146	0.0294
AZ	96.9	0.36	37	58	0.0017	0.0026	0.0222	0.0447
CA	398.9	1.47	152	239	0.0071	0.0106	0.0914	0.1840
CO	93.1	0.34	35	56	0.0017	0.0025	0.0213	0.0430
CT	45.5	0.17	17	27	0.0008	0.0012	0.0104	0.0210
DC	4.0	0.01	2	2	0.0001	0.0001	0.0009	0.0018
DE	16.9	0.06	6	10	0.0003	0.0004	0.0039	0.0078
FL	258.0	0.95	98	155	0.0046	0.0069	0.0591	0.1190
GA	175.7	0.65	67	105	0.0031	0.0047	0.0402	0.0810
HI	22.7	0.08	9	14	0.0004	0.0006	0.0052	0.0105
IA	81.8	0.30	31	49	0.0015	0.0022	0.0187	0.0377
ID	15.6	0.06	6	9	0.0003	0.0004	0.0036	0.0072
IL	244.5	0.90	93	146	0.0044	0.0065	0.0560	0.1128
IN	239.9	0.88	91	144	0.0043	0.0064	0.0549	0.1107
KS	77.8	0.29	30	47	0.0014	0.0021	0.0178	0.0359
KY	151.5	0.56	58	91	0.0027	0.0040	0.0347	0.0699
LA	180.5	0.66	69	108	0.0032	0.0048	0.0413	0.0833
MA	83.6	0.31	32	50	0.0015	0.0022	0.0192	0.0386
MD	80.6	0.30	31	48	0.0014	0.0021	0.0185	0.0372
ME	23.3	0.09	9	14	0.0004	0.0006	0.0053	0.0107
MI	189.9	0.70	72	114	0.0034	0.0051	0.0435	0.0876
MN	102.8	0.38	39	62	0.0018	0.0027	0.0235	0.0474
MO	139.8	0.51	53	84	0.0025	0.0037	0.0320	0.0645
MS	65.1	0.24	25	39	0.0012	0.0017	0.0149	0.0300
MT	35.1	0.13	13	21	0.0006	0.0009	0.0080	0.0162
NC	152.3	0.56	58	91	0.0027	0.0041	0.0349	0.0703
ND	49.9	0.18	19	30	0.0009	0.0013	0.0114	0.0230
NE	43.6	0.16	17	26	0.0008	0.0012	0.0100	0.0201
NH	22.0	0.08	8	13	0.0004	0.0006	0.0050	0.0101
NJ	128.6	0.47	49	77	0.0023	0.0034	0.0295	0.0594
NM	59.0	0.22	22	35	0.0011	0.0016	0.0135	0.0272
NV	47.9	0.18	18	29	0.0009	0.0013	0.0110	0.0221
NY	216.7	0.80	82	130	0.0039	0.0058	0.0496	0.1000
OH	263.6	0.97	100	158	0.0047	0.0070	0.0604	0.1216
OK	100.4	0.37	38	60	0.0018	0.0027	0.0230	0.0463
OR	42.5	0.16	16	25	0.0008	0.0011	0.0097	0.0196
PA	282.5	1.04	107	169	0.0050	0.0075	0.0647	0.1304
RI	11.0	0.04	4	7	0.0002	0.0003	0.0025	0.0051
SC	87.5	0.32	33	52	0.0016	0.0023	0.0200	0.0404
SD	14.0	0.05	5	8	0.0002	0.0004	0.0032	0.0064
TN	123.6	0.45	47	74	0.0022	0.0033	0.0283	0.0570
TX	652.5	2.40	248	391	0.0116	0.0174	0.1495	0.3010
UT	65.7	0.24	25	39	0.0012	0.0017	0.0150	0.0303
VA	129.0	0.47	49	77	0.0023	0.0034	0.0295	0.0595
VT	7.0	0.03	3	4	0.0001	0.0002	0.0016	0.0032
WA	82.9	0.30	32	50	0.0015	0.0022	0.0190	0.0382
WI	108.8	0.40	41	65	0.0019	0.0029	0.0249	0.0502
WV	113.0	0.42	43	68	0.0020	0.0030	0.0259	0.0521
WY	63.9	0.24	24	38	0.0011	0.0017	0.0146	0.0295
U.S. Total	5,942.2	21.86	2261	3558				

Even if the entire Western world were to close down its economies completely and revert to the Stone Age, without even the ability to light fires, the *growth* in emissions from China and India would replace our *entire* emissions in little more than a decade. In this context, any cuts in emissions from Alaska would be extravagantly pointless. Alaska's carbon dioxide emissions, at their sum total, effectively do not impact world climate in any way whatsoever.

Costs of Federal Legislation

What would be the potential costs to Alaska of legislative actions designed to cap greenhouse gas emissions? An analysis was recently completed by the Science Applications International Corporation (SAIC), under contract from the American Council for Capital Formation and the National Association of Manufacturers (ACCF and NAM), using the National Energy Modeling System (NEMS); the same model employed by the US Energy Information Agency to examine the economic impacts.

For a complete description of their findings please visit:

<http://www.accf.org/pdf/NAM/fullstudy031208.pdf>

To summarize, SAIC found that by the year 2020, average annual household income in Alaska would decline by \$1,095 to \$3,552 and by the year 2030 the decline would increase to between \$4,548 and \$8,294. The state would stand to lose between 2,000 and 4,000 jobs by 2020 and between 6,000 and 9,000 jobs by 2030. At the same time gas prices could increase by more than \$5 a gallon by the year 2030 and the states' Gross Domestic Product could decline by then by as much as \$2 billion/yr.

And all this economic hardship would come with absolutely no detectable impact on the course of future climate. This is the epitome of a scenario of all pain and no gain.

Suggested Additional Readings

Reply to response to Dyck on polar bears and climate change in western Hudson Bay

http://scienceandpublicpolicy.org/other/soon_reply_to_response_dyck.html

Some Things We Know and Don't Know About Polar Bears

http://scienceandpublicpolicy.org/originals/some_things_we_know_and_don_t_know_about_polar_bears.html

"Arctic Icecap is Melting, Even in Winter"

http://scienceandpublicpolicy.org/scarewatch/artic_icecap_is_melting_even_in_winter.html

Demographic and Ecological Perspectives on the Status of Polar Bears

http://scienceandpublicpolicy.org/reprint/demographic_and_ecological_polar_bear_perspectives.html

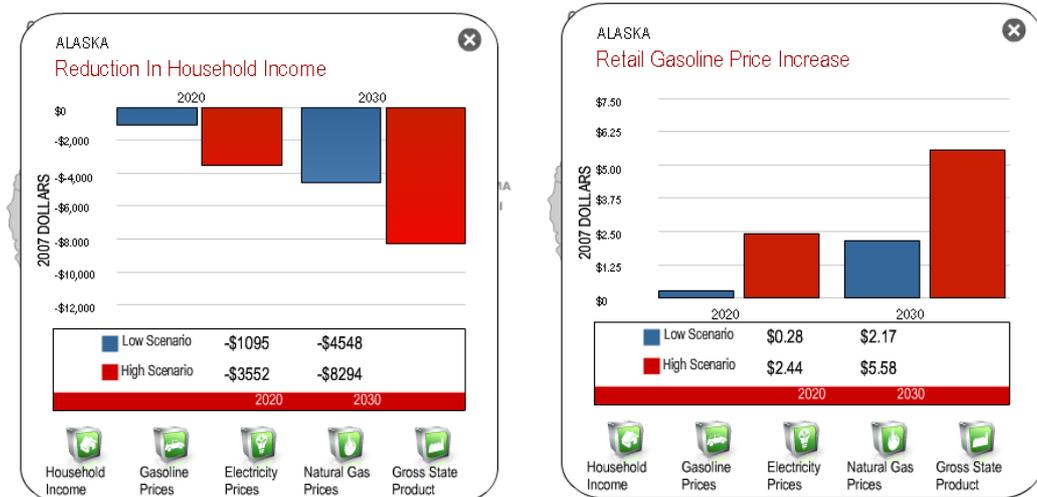


Figure 12. The economic impacts in Alaska of federal legislation to limit greenhouse gas emissions. (Source: Science Applications International Corporation, 2008, <http://www.instituteforenergyresearch.org/cost-of-climate-change-policies/>)

Alaska Scientists Reject UN’s Global Warming Hypothesis

At least 141 Alaska scientists have petitioned the US government that the UN’s human caused global warming hypothesis is “without scientific validity and that government action on the basis of this hypothesis would unnecessarily and counterproductively damage both human prosperity and the natural environment of the Earth.”

They are joined by over **31,072** Americans with university degrees in science – including **9,021** PhDs.

The petition and entire list of US signers can be found here: <http://www.petitionproject.org/index.html>

Appendix: Recent *global* temperatures: As the global temperature graphs below show, a decline in temperatures have now persisted for seven years. The fall in temperatures between January 2007 and January 2008 was the greatest January-January fall since records began in 1880.

Cooling at a rate equivalent to >2 Celsius/century
Global temperature anomalies & trend, 1991-2003: SPPI Index

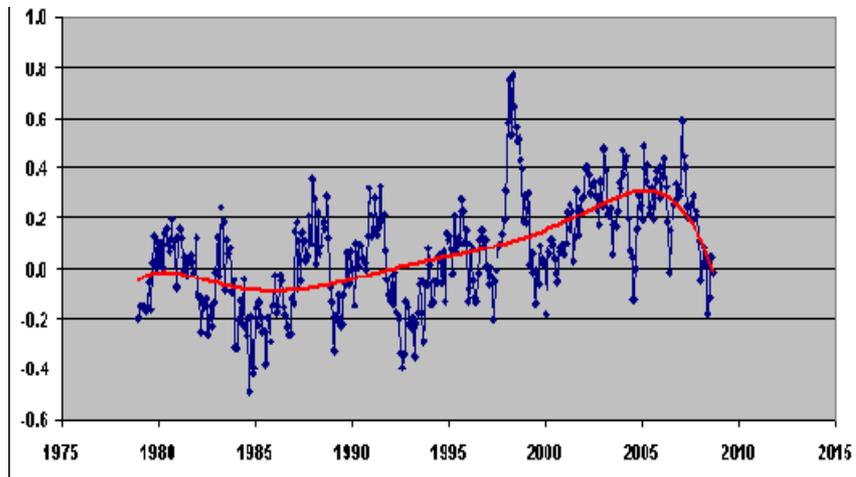
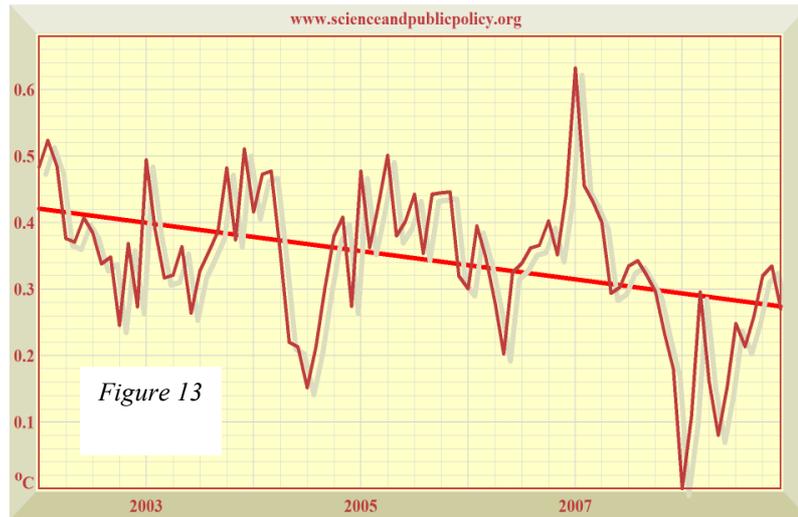


Figure 14. Lower-troposphere global surface temperature anomalies, 1979-2008 (UAH satellite data).

The year 2008 turned out to have been no warmer than 1980 – 28 years ago. This is not a short-run change: the cooling trend set in as far back as late 2001, seven full years ago, and there has been no net warming since 1995 on any measure.



References

- Energy Information Administration, 2007a. International Energy Annual, 2005 (and updates) U.S. Department of Energy, Washington, D.C., <http://www.eia.doe.gov/iea/contents.html>
- Energy Information Administration, 2007b. Emissions of Greenhouse Gases in the United States, 2006 (and updates). U.S. Department of Energy, Washington, D.C., [http://www.eia.doe.gov/oiaf/1605/ggrpt/pdf/0573\(2006\).pdf](http://www.eia.doe.gov/oiaf/1605/ggrpt/pdf/0573(2006).pdf)
- Hare, S.R. and R.C. Francis. 1995. [Climate Change and Salmon Production in the Northeast Pacific Ocean](#). In: R.J. Beamish [ed.] Ocean climate and northern fish populations. *Can. Spec. Pub. Fish. Aquat. Sci.*, **121**, 357-372, http://www.iphc.washington.edu/Staff/hare/html/papers/hare-francis/abst_h-f.html
- Harper, J.R., 1978. Coastal erosion rates along the Chukchi Sea coast near Barrow, Alaska. *Arctic*, **31(4)**, 428-433.
- Hartmann, B., and G. Wendler, 2005. The significance of the 1976 Pacific Climate Shift in the climatology of Alaska. *Journal of Climate*, **18**, 4824-4839.
- Hartwell, A.D., 1973. Classification and relief characteristics of northern Alaska's coastal zone. *Arctic*, **26(3)**, 244-252.
- Hu, F.S., et al., 2001. Pronounced climatic variations in Alaska during the last two millennia. *Proceedings of the National Academy of Sciences*, **98**, 10552-10556.
- Hume, J.D., and M. Schalk, 1967. Shoreline processes near Barrow Alaska: a comparison of the normal and the catastrophic. *Arctic*, **20(2)**, 86-103.
- Hume, J.D., et al., 1972. Short-term climate changes and coastal erosion, Barrow Alaska. *Arctic*, **25(4)**, 272-278.
- Kaufman, D.S., et al., 2004. Holocene thermal maximum in the western Arctic (0-180°W). *Quaternary Science Reviews*, **23**, 529-560.
- Lewellen, R., 1977. *A study of Beaufort Sea coastal erosion, northern Alaska. Environmental Assessment of the Alaskan Continental Shelf*, Annual Reports of the Principal Investigators, Vol. XV (Transport). National Oceanic and Atmospheric Administration, pp. 491-527.
- MacCarthy, G.R., 1953. Recent changes in the shoreline near Point Barrow, Alaska. *Arctic*, **6(1)**, 44-51.

Mantua, N.J. 1999 : *The Pacific Decadal Oscillation. A brief overview for non-specialists*, to appear in the Encyclopedia of Environmental Change, http://www.atmos.washington.edu/~mantua/REPORTS/PDO/PDO_egec.htm.

Monnett, C., Gleason, J. S., and L. M. Rotterman, 2005. Potential effects of diminished sea ice on open-water swimming, mortality, and distribution of polar bears during fall in the Alaskan Beaufort Sea. 16th Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA.

Monnett, C., and J. S. Gleason, 2006. Observations of mortality associated with extended open-water swimming by polar bears in the Alaskan Beaufort Sea. *Polar Biology*, **29**, 681-687.

Verdon, D. C., and S. W. Franks, 2006. Long-term behaviour of ENSO: Interactions with the PDO over the past 400 years inferred from paleoclimate records. *Geophysical Research Letters*, **33**, L06712, doi:10.1029/2005GL025052.

Wiedinmyer, C., and J.C. Neff. 2007. Estimates of CO₂ from Fires in the United States: Implications for Carbon Management. *Carbon Balance and Management*, **2**:10, doi:10.1186/1750-0680-2-10

Wigley, T.M.L., 1998. The Kyoto Protocol: CO₂, CH₄ and climate implications. *Geophysical Research Letters*, **25**, 2285-2288.

