

Alaska Conservation Solutions

The Evidence in Alaska: 2004 - 2008

The Nation's Global Warming Epicenter

Background:

In 2004, the Arctic Climate Impact Assessment documented significant, adverse impacts from global warming on Alaska. Since the publication of this authoritative study, there have been substantial additional impacts. This "Evidence in Alaska" paper highlights some of the most notable changes and analyses.

As one of the leading snow and ice scientists in the world, Dr. Mark Serreze, has observed: "The Arctic is screaming."

Evidence is presented below on the following issues:

- I. Temperature
- II. Arctic Ice Cap
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I. Temperature:

Alaska has warmed 4 degrees F in the last 50 years.

This compares with the global average of a little over 1 degree F. ([National Assessment Synthesis Team](#))

The [2008 Arctic Report Card](#), issued by the National Oceanic and Atmospheric Administration (NOAA) and four partner institutions, notes that “the year 2007 was the warmest on record for the Arctic, continuing a general, Arctic-wide warming trend that began in the mid-1960s.” The report also states that “autumn temperatures are at a record 5 degrees C (9 degrees F) above normal, due to the major loss of sea ice in recent years which allows more solar heating of the ocean.”

Warmer Arctic Ocean Temperatures.

Scientists with the U.S. National Snow and Ice Data Center (NSIDC) have found - as predicted - that the loss of Arctic Sea Ice has resulted in anomalously high Arctic temperature increases in the autumn ([The Independent 12/16/08](#); [BBC 12/17/08](#)). This past autumn, some temperatures north of Alaska in the Beaufort Sea were more than 7 °C higher than normal.

When there is no ice, instead of being reflected, solar radiation is absorbed by the ocean and transformed into heat. "In autumn...most of the heat that was gained in the ocean during the summer is released back to the atmosphere, acting to warm the atmosphere. It is this heat-release back to the atmosphere that gives us Arctic amplification," notes Dr. Julienne Stroeve.

More generally, temperatures in the fall have been six to 10 degrees warmer than in the 1980's ([Associated Press 12/16/08](#)).

University of Washington scientists disclosed data showing the warmest surface temperatures in the Arctic Ocean ever recorded. In some locations, temperatures were 5 °C above normal ([University of Washington 12/12/07](#)). The ocean north of Alaska and Eastern Siberia experienced the greatest summer warming, generally 3.5 °C warmer than historical averages and 1.5 °C warmer than ever recorded.

University of Alaska scientists have associated loss of sea ice to increases in Arctic land-based temperatures and increased tundra greening ([Science Daily 12/22/08](#)) Upon examining a 50-kilometer band around the Arctic Ocean coastline, the scientists found that between 1982 and 2007, summer sea ice decreased by 27%. There was a corresponding 24% increase in greening adjacent to the Beaufort Sea in northern Alaska and Canada.

Alaska is on the front lines; it is the melting tip of the iceberg; it is the canary in the coal mine.

II. Arctic Ice Cap:

2008 Ice Cap Second Smallest Ever Recorded.

In mid-September, the Arctic Ice Cap shrank to the second smallest area ever recorded ([NOAA 9/16/08](#); [Reuters 9/16/08](#); [BBC 9/16/08](#)). It was 33% below the average minimum summer ice cover, measured between 1979 and 2000. This year's shrinkage was especially notable because it occurred in a relatively cool summer (due to La Niña conditions) without either strong, ice-clearing winds or cloudless skies. As one scientist at the National Snow and Ice Data Center (NSIDC) observed, "I think this summer's (ice loss) has been more remarkable than last year" (the record breaking year). Notably, the ice loss in August "saw the fastest-ever rate of seasonal retreat during that period...and declined at a rate of 32,700 square miles per day, compared to a rate of about 24,400 square miles per day in August 2007" ([ScienceDaily 9/8/08](#)).

Arctic Ice Cap Becomes an Island in 2008.

For the first time since satellite images became available, open water entirely encircled the Arctic Ice Cap in 2008, with the "Northwest Passage and the Northern Sea Route both being open at the same time" ([NASA 9/8/08](#), quoting NSIDC; [New York Times 9/7/08](#)).

Record-Setting 2007 Arctic Sea Ice Minimum.

In 2007 the Arctic Ice Cap melted to 4.13 million square kilometers, dramatically less than the previous minimum of 5.32 million square miles set in September 2005 ([BBC 9/21/07](#)). The 1.19 million km² loss is equivalent to the area of California and Texas combined; an area the size of Florida melted away in just 6 days ([ABC News 9/10/07](#)).

The National Snow and Ice Data Center (NSIDC) provides current [Arctic Sea Ice News and Analysis](#) online.

Sea Ice Becoming Dramatically Thinner.

The [2008 Arctic Report Card](#), issued by the National Oceanic and Atmospheric Administration (NOAA) and four partner institutions, looked at data from the 1950s and 1960s and concluded, "Helicopter-borne and ice-based electromagnetic measurements indicate a reduction of modal and mean sea ice thicknesses in the region of the North Pole of up to 53 and 44%, respectively, between 2001 and 2007...and now very little ice older than 5 yr remains."

In a separate study published in the journal *Geophysical Research Letters* in 2008, scientists measured a plummeting of winter ice thickness in 2007 ([BBC News 10/28/08](#)). The ice was an average of 0.9 feet less than the 2002-2008 average, with the western Arctic thinning by up to 1.6 feet.

Arctic Sea Ice Loss Impacts Phytoplankton Blooms.

Stanford scientists have found that loss of arctic sea ice is causing shifts in explosive phytoplankton blooms ([SFGate 11/21/08](#)). Using satellite data, the researchers looked at changes in the amount of chlorophyll in these marine waters. "Continued reductions in Arctic sea ice and the associated increase in primary production (of phytoplankton) are almost certain to impact marine ecosystems...and could precipitate profound ecological shifts."

III. Glaciers:

Land Ice Melting at Dramatic Rates.

Using a combination of satellite images, aerial photographs and maps, a 550-page book entitled *Glaciers of Alaska*, published by the U.S. Geological Survey in 2008, documented the fact that 99% of Alaskan glaciers are retreating. "Most glaciers in every mountain range and island group in Alaska are experiencing significant retreat, thinning or stagnation" ([USGS Press Release 10/6/08](#); [Mongabay 10/6/08](#)).

According to NASA satellite data, since 2003 more than 2 trillion tons of ice have melted from Alaska, Greenland, and Antarctica ([Associated Press 12/16/08](#)). Alaska alone has lost 400 billion tons of land ice since 2003.

NASA scientists have also calculated that Gulf of Alaska glaciers have been losing 84 gigatons of ice mass annually ([NASA Public Release 11/6/08](#); [Space Daily/United Press International 11/8/08](#)). In a separate study, scientists determined that melting ice is now the main cause of rising sea levels, surpassing thermal expansion ([AFP 11/19/08](#)).

Fewer Glaciers, More River Discharge, and Changes in Vegetation.

With respect to glaciers, the [2008 Arctic Report Card](#) notes that "the greatest mass losses per unit area are found in Patagonia, Alaska, and northwest United States/southwest Canada. However, because of the corresponding large areas, the biggest contributions in total to sea level rise come from Alaska, the Arctic and the Asian high mountains." In terms of river discharge to the Arctic Ocean, "overall, the twenty-first century to date is characterized by an increased level." With respect to vegetation, tundra areas in the Arctic have become greener, but forested areas have experienced a decline in greenness. The former is due to bushification of the tundra; the latter is due to disease, death and fires in forested areas.

Bering Glacier.

Representing more than 15% of all the ice in Alaska, the Bering Glacier is melting twice as fast as previously believed. The largest and longest glacier in North America, the Bering Glacier is thought by scientists to be releasing approximately 8 trillion gallons of water a year into the ocean – or the equivalent of two Colorado Rivers ([Detroit Free Press 5/12/07](#) ; [Michigan Tech Media 5/10/07](#)).

Columbia Glacier.

An international team of scientists announced in 2007 that the accelerated melting of glaciers and ice caps could add an additional 4 to 9.5 inches of sea level rise by 2100 ([Science 7/19/07](#), [ENS 7/20/07](#), [NewScientist 7/19/07](#)). Currently glaciers and ice caps contribute about 60% of all sea-level rise associated with melting ice.

Tidewater glaciers are especially contributing to this accelerated melting. As the paper explains, Alaska's Columbia Glacier is illustrative. This glacier decreased by approximately 9 miles from 1980 - 2007 and thinned up to 1,300 feet.

McCall Glacier.

In 2007 scientists revealed that the McCall Glacier in the Alaska Brooks Range was melting at a rate nearly double that of 1994 ([BBC 12/25/07](#)). If trends continue, "it's within the realm of possibility that the bulk of the glacier will be gone in 50 years," observed one of the scientists.

Mendenhall Glacier.

One of the world's most visited and photographed glaciers, the Mendenhall Glacier near Juneau, lost 656 feet in 2004 and 269 feet in 2005. According to University of Alaska glaciologist Roman Motyka, the Mendenhall Glacier could come entirely out of the beautiful lake in front of it "in the next few years or less" ([Anchorage Daily News, 10/8/05](#)).

IV. Permafrost:

Deep and Rapid Permafrost Warming.

One of the premier global warming research sites in Alaska is at Toolik Lake Field Station, approximately 150 miles north of the Arctic Circle. In 2008 a scientist there noted, "the rate of change is alarming...Species can't adapt or keep up in an evolutionary sense because everything is happening so fast." Another scientist observed, "The changes are all happening faster than the models had predicted." For example, "at about seven feet below the surface, temperatures have risen about 5.5 degrees in the last 20 years" ([Anchorage Daily News 8/10/08](#)).

In 2007 University of Alaska's Vladimir Romanovsky reported significant warming of the permafrost 66 feet below the surface at Deadhorse and West Dock, the two northernmost monitoring sites in Alaska. A nearly 0.4 °F warming of this deep permafrost between 2006 and 2007 was documented. (Personal correspondence with Dr. Romanovsky).

More Than Twice as Much Stored Carbon.

According to a 2008 study, there is twice as much carbon stored in the permafrost of Alaska and Siberia than previously estimated ([Mongabay 9/1/08](#)), citing a study published in the September

2008 issue of BioScience). Melting permafrost releases two greenhouse gases: methane and carbon dioxide.

Arctic Methane Likely Responsible for Atmospheric Rise.

In 2007 methane concentrations in the atmosphere increased by 0.5%, after being stable for a decade. Biological sources in the warming Arctic were likely responsible for most of that increase, according to several indicators ([BBC 5/23/08](#)).

Potentially Good Permafrost News.

A 2008 study revealed that deep permafrost ice wedges may be less susceptible to thawing than previously feared ([New York Times 9/22/08](#)). Scientists have found ice wedges that are at least 740,000 years old, and thus have survived several past warming periods. However the lead author of the study notes, "I don't want people to think we don't have to worry about global climate change . . . The top couple yards of permafrost are still likely to melt as temperatures warm, and there's plenty of carbon stored in them . . . But the deeper part of the permafrost is probably relatively stable."

V. Storms and Community Impacts:

NASA scientists and others have determined that there has been an increase in frequency and intensity of arctic storms during the last 56 years due to warmer waters ([ScienceDaily 10/14/08](#)).

Huge Storm Destroys Alaska Shorelines.

While the nation focused on hurricanes in the Gulf of Mexico, Western Alaska experienced a brutal storm in late September 2005, adversely affecting 34 communities. The storm surge in Nome was 9 feet above normal high tides, with waves of 12 to 15 feet. Newtok saw 5 to 10 feet of beach disappear along with a 1,000 gallon fuel tank. Unalakleet lost 10 to 20 feet of beach. ([Anchorage Daily News 9/28/05](#)).

Alaska Coastal Villages Face Costly and Rapid Relocation.

Many communities on Alaska's western and northern coasts are being seriously threatened by global warming, for four reasons: 1) melting permafrost; 2) more intense storms; 3) less buffering from sea ice; and 4) rising sea level.

In response to a Congressional request, in 2006 the Army Corps of Engineers issued a [report](#) detailing relocation needs for seven Alaska coastal communities. The report estimates that Shishmaref, Kivalina and Newtok have only 10 to 15 years left at their present storm-battered locations, and predicts that it will cost as much as \$355 million to move them.

Shishmaref, Newtok and Kivalina are federally recognized tribes. A senior planner with the Corps of Engineers firmly believes that these communities should be moved as communities.

"They are the very first of the people that were inhabiting North America thousands of years ago. Talk about a rich and unique American culture. Is it worth it? There's more to it than just economics."

Kivalina.

In February of 2008 the City of Kivalina and the Native Village of Kivalina (a federally recognized tribe) filed a global warming lawsuit in a federal district court against nine oil companies, fourteen electric power companies and one coal company ([Anchorage Daily News 2/26/08](#); [Environment News Service 2/27/08](#)). The suit, which seeks "to recover damages from global warming caused by defendants' actions," is the first global warming lawsuit that has a "discrete, identifiable victim" ([CNN 2/27/08](#)).

Noting that the US Army Corps of Engineers and the US Government Accountability Office have both concluded that Kivalina must be relocated due to global warming, and that the estimated cost for relocation is \$95 to \$400 million, the lawsuit seeks damages on the basis of four claims for relief. The claims are: public nuisance under federal law; private and public nuisance under state law; civil conspiracy; and concert of action. Among other allegations, the lawsuit states that there was a conspiracy to mislead the public regarding the causes and consequences of global warming.

In September of 2007, Kivalina was forced to evacuate almost all of its residents as storm surges threatened the community ([Associated Press 9/13/07](#); [Anchorage Daily News 9/14/07](#)). Kivalina lost approximately 100 feet of coastline from 2004 – 2007.

Newtok.

Newtok, imperiled by melting permafrost and receding shorelines due to global warming, has also received international attention lately. Newtok has lost 2 – 3 miles of land between it and the ocean in the last 40 years. A 2008 flood claimed about 40 feet of riverbank, leaving the river 200 feet from the village.

Newtok has plans to move to Mertarvik, a site nine miles away on Nelson Island, above the flood plain. Newtok and other at-risk communities are still searching for a combination of federal, state and private funding that will enable their relocations.

An [Overview of Erosion, Flooding and Relocation Efforts](#) in Newtok is available online.

Shishmaref.

News organizations and filmmakers from around the world have focused on the coastal village of Shishmaref and its urgent need to relocate because of erosion due to global warming. The [Shishmaref Erosion & Relocation Coalition](#) maintains a website regarding the community's needs and recent developments.

Erosion of Alaska Shorelines Imperils Oil Infrastructure and Wildlife Habitat.

The coastal map of Alaska is being redrawn by global warming, as lands and lakes are being lost to the sea. In 2007 U.S. Geological Survey (USGS) scientists published an important report entitled, "Quantitative Remote Sensing Study Indicates Doubling of Coastal Erosion Rate in Past 50 Years along a Segment of the Arctic Coast of Alaska" (see study [abstract](#); also [Alaska Report 7/9/07](#) and [sfgate.com 7/5/07](#)).

In the last 50 years, areas north of Teshekpuk Lake in northern Alaska have experienced as much as 3,000 feet (0.9 kilometers) of coastal erosion. Notably, the overall rate of erosion for the entire studied area doubled from 0.48 km²/year (during 1955-1985) to 1.08 km²/year (from 1985 – 2005).

Lakes near the coast have been lost due to melting permafrost and greater wave exposure, resulting in initial lake drainage followed by marine flooding. (Graphic [photos and maps](#) of this are available online.) In describing the study, USGS notes "a 30-year warming trend that has resulted in ice-pack shrinkage and deterioration of permafrost" ([USGS website](#)). USGS also observes that "the low-lying Arctic coastal plain north of Teshekpuk Lake hosts endangered and threatened species of waterfowl, is the calving grounds for large herds of caribou, and contains potentially significant petroleum resources."

A 2007 article by Reuters revealed that the Bureau of Land Management (BLM) has identified approximately 30 old oil exploration wells in northernmost Alaska that "need to be cleaned and plugged before the sea claims them" ([Reuters 7/25/07](#)). According to a BLM spokesperson, "Hopefully we'll get all of these wells before anything happens." In 2005 BLM had to do an emergency clean-up and well plug, after more than 300 feet of shoreline was lost in a few months. The well is now entirely underwater.

VI. Infrastructure:

Damage from Global Warming to Alaska's Public Infrastructure Projected to Cost Up to \$6.1 billion by 2030.

In June of 2007 The University of Alaska's Institute of Social and Economic Research (ISER) issued an [in-depth analysis](#) concluding that climate change could make it between \$3.6 and \$6.1 billion more expensive to build and maintain public infrastructure in Alaska between now and 2030, an increase of up to 20%. This calculation does not include increased expenses to private infrastructure or relocation costs for communities like Shishmaref, Newtok and Kivalina.

To conduct the study, ISER developed a data base consisting of nearly 16,000 individual elements of public infrastructure. Water and sewer systems represent the greatest share of extra costs (30%), followed by roads (25%) and airport runways (24%). These costs are just a small fraction of the total costs of climate change to Alaska. As the lead author of the study noted: "There are a million other issues related to climate change. This is just one component" ([New York Times 6/28/07](#); [Associated Press 6/27/07](#)).

Global Warming Claims Alaska National Defense Sites.

In 2007 the Pentagon announced that they planned to close three North American Aerospace Defense Command early-warming radar sites in Alaska, due entirely or in part to the fact that global warming is undermining the foundation for these facilities (New York Times 12/7/07). The radar site at Point Lonely, on Alaska's North Slope coast, has been shut down specifically due to soil erosion caused by climate change.

VII. Human Diseases:

Serious Insect Stings Increase Significantly.

According to a 2008 study in the Alaska Epidemiology Bulletin, insect stings have increased substantially over the last 10 years, and have been occurring farther north (Anchorage Daily News 5/18/08). Specifically, there has been a seven-fold increase in insect stings in Northern Alaska, and two people died in 2006.

A University of Alaska professor reported that in Fairbanks, "the yellow jacket population has increased tenfold" as a result of global warming (Reuters 3/25/08).

Rabies Concerns.

A professor at the University of Alaska, Dr. Erich Follman, is concerned about future increases in rabies due to climate change (Fairbanks Daily News Miner 9/19/08). Because red foxes are more susceptible to rabies than arctic foxes, their northward expansion could increase the number of foxes with rabies. Reduced sea ice also forces foxes closer to humans, dogs and other companion animals.

Oyster Contamination.

In the October 6, 2005 issue of the New England Journal of Medicine, a team of scientists confirmed the connection between increasingly warm water temperatures and the outbreak of an infection, caused by *Vibrio parahaemolyticus* in Alaskan oysters, that sickened scores of humans. There were no known outbreaks of *V. parahaemolyticus* in Alaskan oysters before 2004, when water temperatures reached 15 degrees C, the threshold survival temperature for the organism.

The disease is a relative of cholera, and causes extreme gastroenteritis. This study is one of the first to document such a dramatic shift in latitude of a formerly tropical health problem. (ABC News 10/5/05).

VIII. Animals:

Global Warming and Animal Diseases in Alaska.

At the 2008 Alaska Forum on the Environment, Dr. Eric Hoberg of the US Department of Agriculture discussed why global warming presents significant risks to animals from expanded diseases ([KTUU 2/13/08](#)). "We think that parasites, pathogens, these disease-causing organisms have the potential to have a very dramatic affect on things like caribou, sheep, wild sheep, moose, musk oxen." Warmer temperatures increase range and development rates for vectors and diseases, and "the general feeling in the broader community is that this is outside of the capacity for populations to be resilient or those species to be able to adapt effectively."

Polar Bears.

Polar Bears Going Hungry in the Spring.

In a 2008 study published in the journal Polar Biology, researchers found that the percentage of Beaufort Sea polar bears in a state of fasting in the spring increased from 9.6% and 10.5% in 1985 and 1986 respectively, to 21.4% and 29.3% in 2005 and 2006 ([environmentalresearchweb 12/4/08](#)).

Spring melting of the Arctic ice cap now starts an average of 13 days earlier than during the 1980s. As scientist Dr. Seth Cherry observes, "It is likely that a decrease in prey availability during spring in recent years has resulted in the increased proportion of polar bears fasting during April and May." Co-author Dr. Andrew Derocher further notes that "it is clear that the changes in the sea ice are affecting the hunting opportunities available to the bears" ([NewScientist 1/1/09](#)).

A Long Way from Home and Starving.

Polar bears continue to be located and then killed hundreds of miles from the ocean. In the spring of 2008 three polar bears (a mother and two cubs) roamed more than 250 miles south of their usual range in Canada. "Even if the polar bears had not been killed, and instead had been relocated to the Arctic Ocean . . . they likely would not have lived much longer given how close to death they were from starvation" ([CBC News 4/4/08](#)). According to a polar bear expert, this is another indication of the impacts from global warming ([CBC News 4/3/08](#)).

Polar Bear Cubs Declining and Lower Estimate of Total Population Numbers in the Southern Beaufort Sea.

In a [paper published by USGS](#) in 2006, based on extensive, long-term studies, three leading polar bear scientists concluded that:

- The survival rate for first year polar bear cubs in the southern Beaufort Sea (north of Alaska and Canada) has dropped significantly – from 0.61 per adult female between 1967-89 to 0.25 per adult female between 1990-2006.

- Skull measurements of both first year cubs and adult males were also statistically significantly smaller.
- The current population of southern Beaufort Sea polar bears is now estimated to be only 1,526. This is down from two previous estimates, using different methodologies, of 1,800 (in 1986) and 2500 (in the late 1990s).
- The report notes that recent reports of polar bear drownings and deaths from starvation are unprecedented.

In related news, the World Conservation Union (IUCN) Polar Bear Specialist Group has concluded that five populations of polar bears are declining: Southern Beaufort Sea, Western Hudson Bay, Norwegian Bay, Kane Basin, and Baffin Bay. In 2001, they only concluded that one population was declining. Notes Andrew Derocher, head of the Polar Bear Specialist group, “Without stabilizing the climate by taking serious and urgent action on climate change, I don’t see a future for polar bears at all” ([IPS 11/21/06](#)).

Drownings and Swimming Polar Bears.

In 2005, scientists presented evidence, for the first time, of documented polar bear drownings in Alaska waters. In September 2004, scientists found four dead polar bears floating in the ocean 60 miles offshore of northern Alaska, and believe that even more died ([Wall Street Journal 12/14/05](#)). Because of global warming, the Arctic Ocean ice sheet has retreated significantly and storms have increased. In September 2004, the ice sheet was 160 miles from shore. Polar bears expend critical energy when they swim, and swimming long distances – especially over 50 miles – can be debilitating.

During the course of one day in 2008, federally contracted observers spotted nine polar bears swimming in the open waters of the Chukchi Sea, which is part of the Arctic Ocean ([Associated Press 8/22/08](#)). As a former USGS polar bear biologist notes, "To find so many animals at sea in a single survey, on a single day is extremely significant." They were 15 to 65 miles from Alaska's shore and many were swimming north in search of ice. At the time, the main pack ice was 400 miles offshore, with one small neck of ice 100 miles offshore.

Researchers have documented a significant shift in the location of polar bears. Between 1979 and 1991, 87% were found mostly on sea ice. This percentage fell to 33% from 1992 to 2004.

Due to global warming, polar bear populations in Hudson Bay have declined 22% in 17 years because sea ice has been breaking up four weeks earlier ([Wall Street Journal 12/14/05](#)).

Polar Bears Driven to Cannibalism Because of Global Warming.

In 2006 several prominent polar bear biologists reported, for the first time, evidence of a male polar bear killing a mother in her maternal den (two cubs also died). The scientists also observed two other bears that had been cannibalized: a mother (who was with a cub) having recently

emerged from her den, and a yearling male (Polar Biology 2006). All of these field observations took place within a 2-month period in 2004.

The killings occurred adjacent to the Southern Beaufort Sea, where global warming has caused significant ice retreats, and the nutritional condition of the bears was compromised. "During 24 years of research on polar bears in the southern Beaufort Sea region of northern Alaska and 34 years in northwestern Canada, we have not seen other incidents of polar bears stalking, killing, and eating other polar bears," stated the researchers in their paper.

"We hypothesize that nutritional stresses related to the longer ice-free seasons that have occurred in the Beaufort Sea in recent years may have led to the cannibalism incidents we observed," concluded the scientists.

Polar Bear Denning Imperiled.

In early 2007 USGS scientists described substantial polar bear denning dislocations from sea ice to land. Between 1985 and 1994, the percentage of dens on sea ice was 62%, but that percentage dropped to only 37% between 1998-2004 (Associated Press 1/23/07).

Scientists are concerned that the sea ice will retreat so far that the bears will not be able to swim across the expanse of water to reach land to den. "Right now, pregnant females...must wait up to a month longer than they did even 10 years ago for new sea ice to form so they can travel to denning areas on land," notes Dr. Steve Amstrup ([San Francisco Chronicle 7/13/07](#)).

Polar Bears Seriously Threatened by Shrinking Ice.

The United States Geologic Service (USGS) published a dire study that predicts the loss of polar bears from Alaska by 2050, together with an overall elimination of two-thirds of the global population ([Anchorage Daily News 9/8/07](#); [Washington Post 9/8/07](#)).

Notes leading polar bear researcher, Dr. Steven Amstrup, "Our results have demonstrated that as the sea ice goes, so goes the polar bear" ([Christian Science Monitor 9/13/07](#)).

Fortunately, the study indicates that a core population of polar bears can continue to survive near Canada. If we reduce greenhouse gases quickly and meaningfully, this core population can serve as the basis for rebuilding a larger population. In other words, with greenhouse gas reduction actions, polar bears will not go extinct. Alaska Conservation Solutions has been quoted as stating: "Our generation has the ability to write a death sentence for the polar bear, or to take action to assure that the species survives."

Polar Bear Listings.

In May of 2008 the Department of Interior listed polar bears as threatened under the Endangered Species Act. This is an important development, not only for polar bears, but also for the battle against global warming.

- The Rationale: Secretary Kempthorne based his listing decision on three factors: sea ice is critical to the survival of polar bears; sea ice “has dramatically melted in recent decades;” and reliable models project future significant loss of sea ice due to climate change (Secretary Kempthorne's Speech 5/14/08; Scientific American 5/14/08; New York Times 5/15/08).
- The Rule: “We find, based on the best available scientific and commercial information, that polar bear habitat...is declining...that this decline is expected to continue for the foreseeable future, and that this loss threatens the species throughout all of its range.” The 93-page [final rule](#) was published in the Federal Register.

In 2006, the World Conservation Union (IUCN) classified polar bears as vulnerable, noting that they “are set to become one of the most notable casualties of global warming” (News Release, IUCN, 5/2/06).

Polar Bear Critical Habitat.

The Department of Interior agreed to designate critical habitat for polar bears by June 30, 2010 (Reuters 10/7/08).

Hope.

In February of 2008 USGS's leading polar bear biologist, Dr. Steven Amstrup, stated: "There is nothing in our studies that indicates this outcome [extinction] is irreversible." If we significantly decrease our greenhouse gas emissions in the next 40 years, we can maintain a population of polar bears in the Canadian Archipelago. Then when the Arctic Ice Cap recovers, polar bears in Alaska "can repopulate. There's still time" ("The Bone Pile," Alaska Magazine 2/2008).

Most Sensitive – Narwhals, Polar Bears and Others.

Employing a quantitative index analysis, researchers have determined that the Arctic marine mammals most sensitive to climate change are the narwhal, polar bear, hooded seal, bowhead whale and walrus, “primarily due to their reliance on sea ice and specialized feeding” (Ecological Society of America 4/23/08; Associated Press 4/26/08). The report also concludes that only reductions in greenhouse gas emissions can ultimately protect Arctic marine mammals.

Walrus.

Alaska Walrus Young Separated from Mothers.

Scientists reported that during 2004, nine lone walrus calves were swimming in deep waters off northern Alaska, a highly unusual sighting. Walrus mothers and pups rarely separate during the first two years of life because the young cannot feed themselves and are dependent on their mothers' milk (Aquatic Mammals 4/06, Washington Post 4/15/06). According to one of the scientists, the calves were “swimming around us crying.”

The researchers found that water flowing north from the Bering Sea to the Chukchi Sea was 6 degrees warmer than it had been 2 years earlier at the same time and place. The scientists believe that the pups fell into the sea when the sea ice that they lived on with their mothers collapsed because of the influx of this very warm water.

The study concluded that “if walrus and other ice-associated marine mammals cannot adapt to caring for their young in shallow waters without sea-ice available as a resting platform between dives to the sea floor, a significant population decline of this species could occur.”

Walrus Forced onto Land and Stamped Deaths.

Due to record low Arctic sea ice levels in 2007, thousands of walrus -- far more than normal -- were forced on land in Alaska, instead of residing on the pack ice. They also showed up on land in July, a month earlier than ever recorded (Associated Press 10/5/07 & 10/7/07).

The walrus were huddled in haulouts from Barrow to Cape Lisburne, raising concerns about several serious issues: deadly stampedes, food stress, and disease. With respect to food stress, the executive director of the federal Marine Mammal Commission notes, “The big question is whether they will be able to find sufficient prey in areas where they are looking.”

In the same year, tens of thousands of walrus were forced on land in Russia (Associated Press 12/14/07). At one site, there were herds as large as 40,000. Walrus are easily startled, and the crowding resulted in thousands of stampede deaths. “The reason is global warming,” stated Russian biologist Anatoly Kochnev of Russia's Pacific Institute of Fisheries and Oceanography.

Caribou.

Decline in Alaska's Western Arctic Caribou Herd.

“Alaska's largest caribou herd shrank by more than 20 percent between 2003 and 2007, according to a new count from the state Department of Fish and Game (Anchorage Daily News 5/18/08). Warm winter periods are a likely factor, according to the state's lead biologist studying the Western Arctic herd. In 2005, caribou “died in droves” from starvation after warm weather and rain in December caused an “iron-hard crust of snow” that covered this herd's food.

A study published in the journal *Science* demonstrates that precipitation in the Arctic has increased by 7% during the last 50 years, primarily due to human-caused global warming (National Geographic News 4/25/08).

Alaska Caribou Calves Dying.

Caribou calves are dying before reaching maturity in the southern Alaska Peninsula herd. “Calves are being born to healthy-seeming cows but dying well before they reach adulthood . . . In 2007, only one calf per 200 cows was spotted” (Dutch Harbor Fisherman 5/23/08). Hunting of this herd has been closed.

Birds.

Dramatic Decline in Kittlitz's Murrelet.

The Prince William Sound population of Kittlitz's Murrelets declined 97% between 1989-2001; Glacier Bay declined 89% between 1991 and 2000; and Kenai Peninsula declined 83% since 1976 (BirdLife International, Kittlitz's Murrelet Species Fact Sheet, 2006).

“The fate of the Kittlitz's Murrelet may hinge on the fate of Alaska's glaciers, and therefore Kittlitz's may be among the world's first avian species to succumb to the effects of rising global temperatures” (John F. Piatt, USGS. and Kathy Kuletz, USFWS).

Lesser Scaup in Peril.

Population of these diving ducks appears “to be in peril” (Consensus Report 2006). Their numbers declined from over 7 million in the 1970s to 3.39 million in 2005. In 2006 scaup numbers reached an even lower record: 3.2 million (Ducks Unlimited 2007). Scientists link their decline to loss of wetlands, which results in reduced food sources such as amphipods, gastropods and chironomid larvae (Corcoran et. al 2007).

Feeding Problem for Ptarmigan.

Global warming is having a deleterious effect on a major food source for ptarmigan, the Alaska state bird. Willows are now growing fast enough to “beat the ptarmigans” – meaning that an increasing number of shoots are above the browsing range for the birds (RealClimate 12/13/07).

New Wintering Birds in Anchorage.

In 2008 the Great Backyard Bird Count revealed several new wintering species in Anchorage, in addition to larger numbers of other recent winter denizens due to global warming (Anchorage Daily News 2/20/08). For the first time, a pair of short-eared owls was observed, as well as varied thrush. More robins and nuthatches were sighted (85 this year versus 26 last year). The Executive Director of Alaska Audubon pointed to warmer temperatures and, for nuthatches, more bark-beetle killed trees.

IX. Fisheries:

Pollock on the Move: A Food Security Issue.

According to fishermen and some scientists, pollock and other fish in the Bering Sea are moving north, and some pollock are moving into Russian waters (Los Angeles Times 10/19/08). “It will be a food security issue and has an enormous potential for political upheaval.” According to a fisheries oceanographer at the University of Alaska, “An analysis of 25 years of surveys shows that the ranges of most fish are shifting north as the ice and cool water have retreated.” As the

raw material used in fish sticks and imitation crab, pollock is a major food source for the United States.

Global Warming and Disease in Yukon River King Salmon.

The disease *Ichthyophonus hoferi* has emerged in Yukon River king salmon as a result of globally warmed water temperatures ([Los Angeles Times 6/15/08](#)). With global warming, “cold-temperature barriers are giving way, allowing parasites, bacteria and other disease-spreading organisms to move toward higher latitudes.” When infected salmon are smoked or dried, they do not turn into rich red strips of salmon jerky; instead they turn “black and oily like strips of greasy rotten mango.” The work of Dr. Richard Kocan has been instrumental in understanding this disease and its spread in Yukon Kings.

Warming Kenai Rivers are Endangering Salmon.

A stream monitoring study, conducted by Cook InletKeeper and Homer Soil and Water Conservation District, showed that in 2005 a record number of days exceeded temperature limits considered healthy for salmon. At each of the streams monitored, temperatures exceeded -- for more than 80 days -- the “unhealthy for spawning areas” standard of 55 degrees F. The monitors also revealed that each of the streams experienced days with water temperatures above 68 degrees, which state standards declare “shall not be exceeded” ([Anchorage Daily News 2/5/06](#)).

Very Low Pink Salmon Harvests Tied to Hotter Temperatures.

The pink salmon harvest in Southeast Alaska was dramatically lower than predicted in 2006. The Alaska Department of Fish and Game (ADF&G) had forecast a purse seine catch of 52 million. According to preliminary ADF&G numbers the actual harvest was only 11.4 million.

The management director of ADF&G's Juneau area commercial fisheries said, “the low run was caused in large part by the warm temperatures of 2004, when the parents of this season's mature fish would have been affected” ([Anchorage Daily News 10/2/06](#)).

Polar Fish Species Especially Sensitive to Global Warming.

“Some 50 species of commercial fishes that live at or near the poles will likely go extinct” due to global warming, according to scientific analysis ([ScienceNOW 7/10/08](#)). In a separate study, scientists found that warmer water affects sex ratios in some fish: “A rise in water temperature of just 1.5 degrees Celsius can change the male-to-female ratio from 1:1 to 3:1” ([Time 7/30/08](#)).

In a study involving a species of fish from the North Sea, scientists demonstrated that warming-induced deficiency in oxygen uptake and supply to tissues limits fish growth and reproduction. Fish from polar regions have an especially small thermal tolerance window ([Science 1/5/07](#); [NASA 1/4/07](#)).

X. Other Marine Impacts:

Bering Sea Experiencing Major Impacts from Climate Change.

In 2006 a team of 10 scientists published an important paper entitled, “A Major Ecosystem Shift in the Northern Bering Sea” (Science, 3/10/06). The scientists observed that “a change from arctic to subarctic conditions is underway in the northern Bering Sea,” caused by warmer air and water temperatures, and less sea ice. Even bottom water temperatures are demonstrably increasing.

The troubling consequences of this are many. For example, the prey base of benthic (bottom) feeding walrus, endangered sea ducks (like spectacled eiders), and gray whales is declining. Some pelagic (open sea) species like pollock, on the other hand, are increasing their range. The paper concludes: “These observations support a continued trend toward more subarctic ecosystem conditions in the northern Bering Sea, which may have profound impacts on Arctic marine mammal and diving seabird populations as well as commercial and subsistence fisheries.”

Additional Bering Sea Global Warming Concerns.

A 2006 study indicated that Bering Sea snow crab catches had declined 85% in six years along with other crab decreases; and crab populations had shifted northward. Yellowfin sole and Greenland turbot catches also dropped, in addition to declines in fur seals and seabirds. Walrus pups were being abandoned. (Anchorage Daily News 11/5/06)

Global Warming Threatens Bering Sea Food Chain.

According to a study published in Marine Ecology Progress Series, global warming will adversely affect the Bering Sea's phytoplankton, the base of the food chain (Mongabay.com 1/16/08).

Currently the Bering Sea supports large phytoplankton (diatoms), which are eaten by large zooplankton. But a warmer Bering Sea, such as that predicted in 2100, will only produce smaller plankton (nanophytoplankton), resulting in a different and less productive ecosystem. This change also reduces the ability of the ocean to absorb carbon dioxide. “The experiments we did up there definitely suggest that the changing ecosystem may support less of what we're harvesting – things like pollock and hake” (USC Public Release 1/11/08).

Humpback and Fin Whales Reported in the Arctic Ocean; Guadalupe Fur Seal Rescued in Kachemak Bay.

For the first time ever reported, humpback whales have been sighted in the Arctic Ocean, far north of their previous range (Associated Press 11/7/07). Fin whales, the second longest whales in the world, were recorded in the Chukchi Sea.

In Kachemak Bay in Southcentral Alaska, a Guadalupe fur seal was spotted and then rescued. This is the first time this species has been seen in Alaska or anywhere north of Washington (Homer News 10/31/07).

XI. Vegetation:

Fewer and Smaller Ponds in Alaska's Subarctic Boreal Region Due to Warming.

In a four-year study published in the Journal of Geophysical Research in 2006, scientists from the University of Alaska announced a substantial decline in the size and number of closed-basin ponds in interior Alaska. The analysis examined 50 years of satellite imagery from eight study areas in subarctic Alaska, covering more than 10,000 ponds. Between 5 and 54% of the ponds disappeared in the studied areas. All sites also showed a reduction in the area of closed ponds of between 4 and 31% (Journal of Geophysical Research 10/10/06).

The research and analysis "indicates that these landscape-level changes in ponds are associated with recent climate warming in Alaska" (Institute of Arctic Biology, News Release 10/12/06). Shrinking and disappearing ponds have many ramifications including adverse impacts on migratory birds and the people who depend on them as a food source.

Kenai Open Wetlands Shrinking at Increasing Rate.

In 2007 Alaska's Ed Berg and Kacy McDonnell documented the accelerating loss of open wetlands in the Kenai Peninsula (Refuge Notebook Article 12/7/07). The study involved digitalizing and then comparing aerial photos from 1951, 1968, and 1996. The aerial photos "show a drying landscape, especially between 1968 and 1996." This is due to warmer weather and a decrease in available water because of increased rates of evaporation and transpiration.

The scientists calculated that the average water balance for 1944-1967 was 3.9 inches of water, while the average balance for 1968-2005 was only 1.2 inches, a 70% decline. The loss of open wetlands means, among other impacts, a decline in fuel breaks for fires.

Kenai National Wildlife Refuge Drying Significantly.

According research published in 2005, the Kenai National Wildlife Refuge has changed dramatically in the last five decades. Eric Klein and his colleagues found that in the areas studied, wetlands had decreased by 88%, open areas by 35%, and water/lakes by 14%.

Bushes, such as dwarf birch and blueberries, now grow in areas where wetlands previously existed for 8,000 to 12,000 years. Klein notes that "there is an overall environment shift occurring in Alaska...it's a bioindicator of climate change and what is happening to the planet as a whole." (ENS 9/28/05).

Massive Alaska Yellow Cedar Die-Off Because of Climate Change.

Scientists with the US Forest Service have documented a massive die-off of yellow cedar on over 500,000 acres of land in Southeast Alaska. Many consider yellow cedar the Tongass National Forest's most valuable tree, in both economic and cultural terms.

Because of warmer temperatures, there has been less snow to protect the tree roots and also early de-hardening of the foliage. When a subsequent late freeze occurs, the foliage and roots are severely injured, leading to tree death. The scientists investigating the dramatic decline in yellow cedar have eliminated all other possible causes except climate change.

"It's kind of a paradox that the trees are dying from freezing episodes that are ultimately caused by climate warming", said Paul Hennon, a federal scientist in Juneau who has studied the yellow cedar decline" since the 1980's (Juneau Empire 3/26/06).

Tree-line Changing as Alaska's Kenai Mountains Warm.

Two Alaska Pacific University graduate students have documented significant changes in the tree-line in the Kenai Mountains (Refuge Notebook 6/1/07). Using a rigorous methodology that compared aerial photos from 1951 with photos from 1996, the graduate students found that closed-canopy forest points above 1500 feet doubled from 8% to 16%.

Most dramatically, 20% of the tundra above 1500 feet disappeared, having changed to shrub or open-woodland. Changes were greater on northern exposures than southern exposures, but overall, tree-line had increased by almost three feet each year since 1951.

Arctic Trees, Bushes and Global Warming.

In 2008 Dr. Terry Chapin noted, "Effects of vegetative changes will be felt first and most strongly locally – in the Arctic." On the eastern slopes of Siberia's northern Ural Mountains, north of the Arctic Circle, tree line has advanced 20 to 60 meters up the mountains, overrunning tundra in some places. Dr. Glenn Juday points out other factors that can promote tree expansion, such as tundra fires. Shrubification has also occurred extensively. All of this will decrease albedo and likely increase the release of greenhouse gases (ScienceNews 6/20/08).

Alaska's Boreal Forests Changing Significantly.

According to a 2005 study that analyzed thousands of satellite images taken over two decades, vast reaches of Alaska's interior boreal forests exhibited decreased photosynthesis over a period of 22 years. Scott Goetz, a senior scientist at Woods Hole Research Center, analyzed the satellite data and noted: "Everyone was assuming that these (boreal) forests were going to continue to green, and it turns out that there may be other factors (insects and drying) that are causing unexpected results... Alaska's pretty dramatic." (Anchorage Daily News: 9/15/05)

Dr. Glenn Juday noted in the same article, "No matter what you do, or what interest you have in this part of the world, it's very likely to be affected (by climate change)." The boreal forest is especially at risk. "If temperatures rise as climate models predict, Juday figures all three boreal

forest species could be eliminated from vast portions of the Interior by the end of the century." Melting permafrost is also killing some trees by drowning them, according to Dr. Terry Chapin.

New Evidence about Decreased Tree Growth.

In 2007 the House Select Committee on Energy Independence and Global Warming held a briefing on the impacts of global warming on Alaska and the Arctic ([Anchorage Daily News 9/26/07](#); [Fairbanks Daily News Miner 9/26/07](#); [KTUU 9/25/07](#)).

Highlights included field work conducted by University of Alaska professor Dr. Glenn Juday, which showed an inverse relationship between boreal forest tree growth and temperatures: the warmer the temperature, the less the tree growth. Analyzing tree rings, Dr. Juday found that in the very warm summer of 2005, there was almost no tree growth whatsoever. Furthermore, only 48% of healthy trees in the area studied in 1986 were alive in 2007, with most dying because of high temperatures.

XII. Fires:

Tundra fires hit a new record in 2007.

In 2007 a single, massive tundra fire burned more than 90,000 hectares (222,395 acres), the largest tundra fire ever to burn on Alaska's North Slope. Experts are concerned that exposed permafrost will melt more quickly, that plants will take years to recover, that food for caribou could be adversely affected, and that aquatic ecosystems might be altered by the release of nutrients ([Nature 10/9/07](#)).

Forest Fires Ravaged Alaska in 2005 and 2004.

In 2005, approximately 4.6 million acres of Alaska burned, the third largest area ever recorded (an area larger than Connecticut and Delaware combined), at a cost of over \$56 million. In 2004 over 6.6 million acres (an area larger than Maryland) burned, in the largest Alaska fire season ever documented, at a cost of over \$108 million.

According to state forester Chris Maisch, the 2005 season "went against conventional firefighting wisdom that says overwhelming fire seasons don't happen in consecutive years" ([Anchorage Daily News 10/31/05](#)). However these burn rates are entirely consistent with global warming models and predictions. According to the Arctic Climate Impact Assessment, "the area burned in western North America has doubled over the past thirty years, and it is forecast to increase by as much as 80% over the next 100 years under projected climate warming." ([ACIA 2004, p. 56](#)).

Global Warming Contributing to More Mercury Releases from Fires.

In a 2006 study scientists determined that increased fires from global warming are releasing mercury sequestered in soil (especially in Alaska and Canada) at levels up to 15 times great than

previously estimated (ScienceNow/Science Magazine 8/26/06). Between the 1960s and the 1990s, the annual area burned in western Canada and Alaska doubled, consistent with global warming. Forest fires cause a release of nearly all mercury stored on top of and in the ground.

XIII. Archeology:

Alaskan Artifacts Jeopardized by Global Warming.

Indigenous peoples have occupied the region around the coastal village of Point Hope for at least 2,000 years. This area contains some of the richest archaeological resources in Alaska. But because of global warming, the coast is eroding into the sea, washing away forever irreplaceable artifacts and human history.

As Bill Fitzhugh, director of the Arctic Studies Center at the Smithsonian's Museum of Natural History notes: "It's been the most enigmatic and the most important archaeological site we have in Alaska. It's just an amazing site, and it would be really tragic if we can't recover more information from it" (National Public Radio 12/05).

XIV. Winter Economy and Identity:

Alaska's Premiere Winter Activities at Risk.

Fur Rendezvous Sled Dog Race.

In 2006, for the fourth time in ten years, race officials cancelled the Open World Championship Sled Dog Race – the highlight of Anchorage's Fur Rendezvous Festival. Warmth and wind had "decimated" the trails. The president of the Alaskan Sled Dog and Racing Association cited "global warming" as the cause of the cancellation. (Anchorage Daily News 2/22/06)

Iditarod Sled Dog Race.

In 2008, for the sixth time in 10 years, Iditarod organizers were forced to move the start of the Iditarod out of Wasilla to Willow or Fairbanks. Race organizers cited warm weather and a lack of snow for the move, determining that Wasilla was an unsafe launching point for the race.

Iron Dog Snow Machine Race.

Alaska's premiere snow machine race, the 1,800 mile long Iron Dog Race, started in the rain in Southcentral Alaska on February 12, 2006. Describing the race conditions, the lead sentence in the Anchorage Daily News stated: "Rain hammered the puddles on the lake ice here Sunday as the world's longest, toughest and once coldest snowmobile race met global warming" (Anchorage Daily News 2/13/06).

Kuskokwim Sled Dog Race.

In 2009 one of the most important races in Alaska, the Kuskokwim 300 Sled Dog Race, was postponed for two days because of warm weather and mushy trails ([Fairbanks Daily News-Miner 1/19/09](#)). In 2008 the 308-mile sled dog race was dubbed the “Kusko-Swim” because of warm temperatures and a tropical storm ([Anchorage Daily News 1/23/08](#)). Several mushers observed, “It's definitely life-threatening circumstances.”

XV. Ocean Acidification:

An Overview.

In October of 2008 Oceana published a report entitled [“Acid Test: Can We Save Our Oceans from CO₂?”](#) The report summarizes recent findings regarding the threat from ocean acidification to marine life and marine-based economies and communities.

Scientists from the University of Washington and NOAA have calculated that if the world's oceans' continue to absorb 22 tons of carbon/day, the acidity could rise an alarming 150% by the end of the century. To date, the acidity of the earth's oceans' has already increased by 30% since the industrial revolution ([McClatchy News 12/16/07](#)).

According to Dr. Richard Feely with NOAA, “of all the oceans in the world, the North Pacific could be the most vulnerable to acidification,” further demonstrating that Alaska is on the front line of global warming.

Ocean Acidity Increasing Faster Than Anticipated.

Based on almost 25,000 measurements of ocean pH over eight years, scientists have found that marine "acidity increased more than 10 times faster than had been predicted by climate change models and other studies" ([University of Chicago 11/24/08](#)). This acidification is being caused by increased human-contributed atmospheric CO₂ and "will have a severe impact on marine food webs."

EPA Lawsuit.

The Center for Biological Diversity gave the Environmental Protection Agency notice of its intent to sue the Agency for failing to respond to the Center's 2007 petition on ocean acidification and the need for stricter ocean pH standards ([World-Wire 11/14/08](#)).

Citing the Clean Water Act, the [Petition](#) requested that Alaska, as well as Washington, Oregon and Hawaii, list the Pacific Ocean as impaired because of CO₂-enhanced ocean acidification. The petition stated, "Carbon dioxide is degrading water quality and harming marine ecosystems" and noted that approximately 50% of all carbon dioxide produced by humans has dissolved into the ocean, forming the chemical carbonic acid.

XVI. Other Global Warming Concerns:

Warmer Weather Decreases Oil Production on North Slope.

In 2006 Petroleum News reported: "A triple-whammy of seasonally warmer weather, which reduces compressor efficiency, continued pipeline shutdowns...and declining output...resulted in a drop in North Slope oil production in June (Anchorage Daily News 7/14/06).

Nenana Ice Classic Provides Evidence of Global Warming.

Since 1917, one of Alaska's favorite early-spring activities is betting on when the Tanana River will break up. Using a special 26-foot, five-legged tripod that is placed on the ice on the river, the exact time of breakup is measured when the cabled tripod trips a connected clock tower.

According to two researchers from the University of Alaska Fairbanks Geophysical Institute, between 1917 and the early 1960's, there was no long-term change in the breakup data. Since the early 1960s, however, the average breakup date is now 10 days earlier ([UAF Sun Star 10/24/06](#)). In general the breakup data correlated with periods of prolonged warm or cool air.

Alaska's First Greenhouse Gas Emissions Inventory and Forecast Released.

In 2007 the Center for Climate Strategies prepared Alaska's first greenhouse gas emissions inventory and forecast for the Alaska Department of Environmental Conservation. It covered all six greenhouse gases, and all major emitting sectors ([Anchorage Daily News 2/16/07](#)).

Alaska's Largest Oil Company - ConocoPhillips - Urges Congress to Pass Legislation to Reduce Significantly Greenhouse Gases.

ConocoPhillips, the nation's third largest oil and gas company, joined the U.S. Climate Action Partnership. By doing so, it is supporting Congressional legislation that will reduce greenhouse gas levels 60 to 80% below current levels (Associated Press 4/11/07; also see [U.S Climate Action Partnership Consensus Statement](#)).

According to ConocoPhillips' President and CEO, "We recognize that human activity, including the burning of fossil fuels, is contributing to increased concentrations of greenhouse gases in the atmosphere that can lead to adverse changes in global climate."

Members of the U.S. Climate Action Partnership agree that "Congress needs to enact legislation as quickly as possible;" that "Congress should specify an emission target zone aimed at reducing emissions by 60% to 80% from current levels by 2050;" and that "in our view, the climate change challenge, like other challenges our country has confronted in the past, will create more economic opportunities than risks for the U.S. economy." Other business members include British Petroleum, GE, Dow, and Alcoa.

150 Alaska Native Resolutions on Global Warming Presented to the National Congress on American Indians (NCAI).

In 2007 NCAI held their summer meeting in Anchorage, and held many sessions examining the impacts of global warming on Alaska Natives and American Indians. At the conference, Heather Kendall-Miller of the Native American Rights Fund and Anna Davidson of Alaska Conservation Solutions presented 150 resolutions from Alaska Native tribes, corporations and organizations calling for Congressional action to impose mandatory emission reductions (KTUU 6/10/07).

Religious Leaders Call for Climate Change Action in Alaska.

In 2007 religious representatives in Alaska convened a meeting to explore faith-based reasons to address global warming. According to Rev. Sally Bingham, President of Interfaith Power and Light, "Every religion calls for us to be protectors of creation and to serve the poor, so the (global warming) is a religious issue at its core" (KTUU 6/2/07; KTVA 6/4/07).

[Interfaith Power and Light](#) (IPL) is a nationwide, nondenominational coalition of congregations dedicated to reducing the causes of global warming. The [Alaska branch of IPL](#), headed by former Alaska Conservation Solutions employee Mary Walker, expresses its mission as "fulfilling our responsibility to steward Creation."

Major Alaska Poll on Global Warming.

A large, statewide poll on global warming reveals that Alaskans are confident that global warming is occurring, that it is causing significant changes, that it is having adverse impacts, and that it is a serious future threat. (See full poll Leiserowitz & Craciun 2006)

- 81% of Alaskans are convinced that global warming is happening with 43% of Alaskans being completely convinced and 38% being mostly convinced.
- Most Alaskans believe that global warming in Alaska is already, among other impacts, causing or accelerating the loss of sea ice (83%), melting permafrost (82%), coastal erosion (74%) and forest fires (72%).
- 71% of Alaskans think that global warming is a serious threat to people in Alaska; and 76% of Alaskans think that global warming is a serious threat to plants and animals.
- 81% of Alaskans favor having the federal government regulate greenhouse gas emission from power plants.
- 63% of Alaskans trust environmental organization to tell the truth about global warming (compared to 23% for corporations, 29% for Alaskan politicians, 40% for religious organizations, 82% for scientists, and 86% for family and friends).

XVII. CO₂ and Methane Levels:

The latest, deepest ice cores from Antarctica demonstrate that we have a lot more CO₂ and methane (28 and 124 percent higher respectively) in our atmosphere than anytime in the last 800,000 years ([Reuters 5/15/08](#)).

During the last 800,000 years, carbon dioxide has fluctuated between 172 and 300 parts per million. Due to human emissions of carbon dioxide since the Industrial Revolution, it is now (as of April 2008) 384 parts per million (ppm). This represents a 37% increase from the pre-Industrial Revolution levels of 280 ppm.

After almost a decade of little or no increase, methane concentrations increased by 27 tons, or 0.5% between 2006 and 2007 ([BBC 4/24/08](#)).

Implications for Permafrost and Greenhouse Gas Release.

Scientists have determined that the “rate of (air) warming increases substantially during rapid (Arctic Sea) ice loss, especially during autumn,” and this air warming extends as far as 900 miles inland. New scientific models show that if the rate of summer sea-ice loss persists, warming across permafrost areas could increase by up to 3.5 times the rate predicted in previous climate models ([ScienceNOW 6/10/08](#)) and along the Arctic coasts by up to 9 degrees F ([Reuters 6/10/08](#)). This could result in the release of billions of metric tons of carbon dioxide and methane. Central Alaska is especially at risk.

What's in Question.

Arctic soils “are believed to hold about 30 percent of all the carbon stored in the world's soil” ([Independent 6/14/08](#)).

XVIII. What If?

The Worst Case Scenario.

According to a study published in 2005 in the *Journal of Climate*, if carbon dioxide rises 0.45% a year (the current rate is 0.50%), average temperatures in many parts of northern North America could rise more than 25 degrees F by 2100.

The Arctic would see more warming than anywhere else. Arctic tundra would decline from 8% of the world's land area to about 1.8 %, and Alaska would lose almost all of its evergreen boreal forests.

In response to this study, authored by scientists from the Energy Department's Lawrence Livermore National Laboratory and Stanford University, a climate modeler at the National Center for Atmospheric Research stated: “The message is not to give up because the changes

appear overwhelming, but instead the message should be the longer we wait to do something, the worse the consequences” (New York Times 11/1/05).

XIX. The Bottom Line:

What type of earth do we want our children and grandchildren to inherit? Are we prepared to tell future generations that we failed to take responsible measures to safeguard the natural resources that sustain human health *and* support economic vitality?

Global warming can be remedied with practical actions that yield a cleaner, healthier environment, that are ultimately in our best interest.

The clock is ticking. The choice is ours. The time for action is now.

To measure your Alaska Carbon footprint, and to find out how to reduce your carbon dioxide emission and let your voice be heard at the local, state, and national levels, please visit: www.alaskaconservationsolutions.com.

Compiled by Deborah L. Williams
President
Alaska Conservation Solutions
dwilliams@gci.net
907-929-9370 (o)
907-223-1518(c)