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1. CLIMATE CHANGE: Last frontier is front line for warming effects (09/13/2007)

Arthur O'Donnell, *Land Letter* editor

ANCHORAGE, Alaska -- A record high temperature on a late summer day in this rarely hot city might not be an accurate indication of climate change. But with each passing week, it seems that more evidence points to already substantial shifts in patterns affecting weather, water and atmospheric conditions that add up to one inescapable conclusion. While people in many parts of the world continue to debate or deny climate change, its causes and its potential effects, Alaska is already on the front lines of change.



"There's nothing subtle or non-obvious about our changes," said Deborah Williams, president of Alaska Conservation Solutions (ACS) in a recent interview. "And what we're learning on a monthly basis is that the impacts are bigger and faster than expected. Scientists cannot predict accurately, and it is alarming to them."

Williams has been active in promoting awareness of global warming since 1994, initially as a special assistant to the Secretary of the Interior Bruce Babbitt, then for five years as executive director of the Alaska Conservation Foundation before forming ACS in July 2005. Though her understanding of the problem has evolved during that time, the message that she projects far and wide remains consistent: "We, in Alaska, are first-hand global warming witnesses. According to temperature data, we are at ground zero. During the last four decades, Alaska has heated more than anywhere in the country. Our annual temperatures have increased 3-5 degrees F and our winter temperatures have soared 7-10 degrees F. In other words, we are the melting tip of the iceberg," she says.

Increasingly, the evidence appears incontrovertible. Just this week, for example, a National Oceanic and Atmospheric Administration study confirmed that the Arctic ice cap is melting faster than previously thought, and it will shrink 40 percent by 2050 in most regions.

The study, published in the current issue of *Geophysical Research Letters* concludes that Arctic sea ice will retreat hundreds of miles farther from the coast of Alaska in the summer, opening up large areas of water for commercial fishers and giving easier access to new areas for oil and natural gas exploration. Expedited melting could cause upheavals to animal species, as warmer waters endanger those that depend on ice, wrote NOAA oceanographer James Overland and agency meteorologist Muyin Wang.

As if to illustrate that very point, the U.S. Geological Survey reported last week that shrinking sea ice could eliminate two-thirds of the world's polar bears -- and all of Alaska's polar bears -- in the next 50 years. Under this scenario, the only polar bears left by the end of the century would be on some Canadian islands and the western coast of Greenland.

[Click here](#) to read the studies.

Such news, which Williams tracks on a minute-by-minute basis, fits precisely with her construct of Alaskans as the Paul Reverses of global warming. "The BTUs are coming," she declared. "Take action now!"

The effects noted by NOAA and USGS are merely the latest manifestation of changes in ice that have been occurring for decades, she said. Melting ice sheets, receding glaciers and loss of permafrost in turn have serious consequences for critical habitats of polar bears, seals, walrus and Inuit peoples, Williams noted.

Then, there are the effects on species lower on the food chain, such as salmon and birds. "When a glacier melts really fast it puts more sediment into rivers and streams. More sediment means less light penetrates and there is less phytoplankton and fewer creatures all up and down the food chain," she explained.



Despite new efforts to list the polar bear as an endangered species, recent reports from government scientists warn that climate change may be occurring so fast in Alaska and the Arctic that bears will be all but wiped out within 50 years. Photo courtesy of NOAA.

"When animals lose critical habitat, they engage in unusual and often destructive behaviors," she added, citing an "unprecedented" instance of cannibalism by a male polar bear that turned on a female and her cubs, applying behaviors it would normally use against ice seals -- but there were no seals to be had. "This is a desperate attempt to survive that compromises the future of the species," she said.

Villages eroding

Another effect of melting ice is the projected increase in coastal water elevations. In Alaska's coastal communities, this translates to the well-documented problem of erosion that is literally eating away small towns populated by indigenous people.



Loss of permanent ice around the Alaskan island village of Shishmaref has caused serious erosion. One option is to relocate the entire town to higher ground, at an estimated cost of \$1 million per family. Photo by Robert Winfree, NPS.

One of these towns is Shishmaref, located on the Sarichef Island in the Chukchi Sea, north of the Bering Strait. Made up of just 2.8 square miles of land and 4.5 square miles of water within the 2.6 million-acre Bering Land Bridge National Reserve, some 120 miles north of Nome, Shishmaref's footprint is actually shifting northeast and southwest. This exposes the land to massive waves and erosion that is undermining buildings and roads.

Bob Winfree, Alaska regional science adviser for the National Park Service in Anchorage, had just returned from a visit to the Bering Land Bridge reserve and shared his observations and some photos with *Land Letter*.

"The community used to be protected by solid sea ice for much of the year, now it's a storm-battered coast with houses falling down," he said.

All efforts to halt the erosion have been unsuccessful, according to a report on Shishmaref and other coastal sites put out in April 2006 by the Army Corps of Engineers. At great expense, the corps working with the town and the Bureau of Indian Affairs has installed shoreline protection projects -- essentially rock seawalls -- to try to slow or halt the destructive waves.

Residents of Shishmaref, and other communities facing similarly serious erosion problems are faced with a difficult choice: try to restore and rebuild or move the entire town to higher ground. "The estimate to move the community is about \$50 million to \$150 million," Winfree said. For a community of 142 households that means a cost exceeding \$1 million per family.

There are four alternatives being considered, each very expensive:

- To move the entire village to the mainland would cost about \$179 million; \$20 million to move 150 homes; \$26 million to move or build a new school, clinic and city hall complex; \$25 million for a new airport; \$23 million for new roads; and \$25 million for water treatment and sewage facilities.
- Relocate all 142 homes to Nome, more than 120 miles away, at a cost of \$93 million.
- Relocate the entire village to Kotzebue, also about \$93 million.
- Stay on Sarichef Island, but fortify the coast as much as possible, at a cost of \$109 million.

According to the corps report, those costs could be multiplied by at least three to account for the communities that will probably have between 10 and 15 years before being completely undermined by erosion without added protection. Besides Shishmaref, the village of Newtok could cost \$80 million to \$130 million to relocate. Kivalina would cost between \$95 million and \$125 million to relocate.

The corps' report also looked at communities that could have up to 100 years, notably Unalakleet and Bethel, which has already spent more than \$50 million in erosion control measures since 1981.

In all, said the report, the state of Alaska, the corps, the Department of Transportation and the BIA have spent nearly \$75 million since 1981 on erosion control for the seven communities it documented. However, there is no guarantee that such actions will be effective in the future.

Less than permanent permafrost

As one of NPS's top scientists in Alaska, Winfree has gone throughout the huge state to document the effects on public lands, and a giant map on his wall testifies to the thousands of miles he has already logged, with scores of push pins noting locations of his site visits. In classic understatement, he simply calls it "an evolving landscape."