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## Alaska, No Longer So Frigid, Starts to Crack, Burn and Sag

By TIMOTHY EGAN

**A**NCHOR POINT, Alaska, June 13 — To live in Alaska when the average temperature has risen about seven degrees over the last 30 years means learning to cope with a landscape that can sink, catch fire or break apart in the turn of a season.

In the village of Shishmaref, on the Chukchi Sea just south of the Arctic Circle, it means high water eating away so many houses and buildings that people will vote next month on moving the entire village inland.

In Barrow, the northernmost city in North America, it means coping with mosquitoes in a place where they once were nonexistent, and rescuing hunters trapped on breakaway ice at a time of year when such things once were unheard of.

From Fairbanks to the north, where wildfires have been burning off and on since mid-May, it means living with hydraulic jacks to keep houses from slouching and buckling on foundations that used to be frozen all year. Permafrost, they say, is no longer permanent.

Here on the Kenai Peninsula, a recreation wonderland a few hours' drive from Anchorage, it means living in a four-million-acre spruce forest that has been killed by beetles, the largest loss of trees to insects ever recorded in North America, federal officials say. Government scientists tied the event to rising temperatures, which allow the beetles to reproduce at twice their normal rate.

In Alaska, rising temperatures, whether caused by greenhouse gas emissions or nature in a prolonged mood swing, are not a topic of debate or an abstraction. Mean temperatures have risen by 5 degrees in summer and 10 degrees in winter since the 1970's, federal officials say.

While President Bush was dismissive of a report the government recently released on how global warming will affect the nation, the leading Republican in this state, Senator Ted Stevens, says that no place is experiencing more startling change from rising temperatures than Alaska.

Among the consequences, Senator Stevens says, are sagging roads, crumbling villages, dead forests, catastrophic fires and possible disruption of marine wildlife.



These problems will cost Alaska hundreds of millions of dollars, he said.

"Alaska is harder hit by global climate change than any place in the world," Senator Stevens said.

Scientists have been charting shrinking glaciers and warming seas in Alaska for some time. But only recently have experts started to focus on what the warming means to the people who live in Alaska.

The social costs of higher temperatures have been mostly negative, people here say. The Bush administration report, which was drafted by the Environmental Protection Agency, also found few positives to Alaska's thermal rise. But it said climate change would bring a longer growing season and open ice-free seas in the Arctic for shipping.

"There can no longer be any doubt that major changes in the climate have occurred in recent decades in the region, with visible and measurable consequences," the government concluded in the report to the United Nations last month.

It does not take much to find those consequences in a state with 40 percent of the nation's surface water and 63 percent of its wetlands.

Here on the Kenai Peninsula, a forest nearly twice the size of Yellowstone National Park is in the last phases of a graphic death. Century-old spruce trees stand silvered and cinnamon-colored as they bleed sap.

A sign at Anchor River Recreation Area near this little town poses a question many tourists have been asking, "What's up with all the dead spruce trees on the Kenai Peninsula?" The population of spruce bark beetles, which have long fed on these evergreen trees, exploded as temperatures rose, foresters now say.

Throughout the Kenai, people are clearing some of the 38 million dead trees, answering the call from officials to create a "defensible space" around houses for fire protection. Last year, two major fires occurred on this peninsula, and this year, with temperatures in the 80's in mid-May, officials say fire is imminent. "It's just a matter of time before we have a very large, possibly catastrophic forest fire," said Ed Holsten, a scientist with the Forest Service.

Joe Perletti, who lives in Kasilof in the Kenai Peninsula, has rented a bulldozer to clear dead trees from the 10 acres where he lives.

"It's scary what's going on," Mr. Perletti said. "I never realized the extent of global warming, but we're living it now. I worry about how it will affect my children."

Mr. Perletti, an insurance agent, said some insurers no longer sold fire policies

to Kenai Peninsula homeowners in some areas surrounded by dead spruce.

Another homeowner, Larry Rude, has cut down a few trees but has decided to take his chances at the house he owns near Anchor Point. Mr. Rude says he no longer recognizes Alaska weather.

"This year, we had a real quick melt of the snow, and it seemed like it was just one week between snowmobiling in the mountains and riding around in the boat in shirt-sleeve weather," Mr. Rude said.

Other forests, farther north, appear to be sinking or drowning as melting permafrost forces water up. Alaskans have taken to calling the phenomenon "drunken trees."

For villages that hug the shores of the Bering, Chukchi and Beaufort Seas, melting ice is the enemy. Sea ice off the Alaskan coast has retreated by 14 percent since 1978, and thinned by 40 percent since the mid-1960's, the federal report says. Climate models predict that Alaska temperatures will continue to rise over this century, by up to 18 degrees.

Kivalina, a town battered by sea storms that erode the ground beneath houses, will have to move soon, residents say. Senator Stevens said it would cost \$102 million, or \$250,000 for each of the 400 residents.

The communities of Shishmaref, Point Hope and Barrow face a similar fate. Scientists say the melting ice brings more wave action, which gnaws away at ground that used to be frozen for most of the year.

Shishmaref, on a barrier island near the Bering Strait, is fast losing the battle to rising seas and crumbling ground. As the July 19 vote on whether to move approaches, residents say they have no choice.

"I'm pretty sure the vote is going to be to move," Lucy Eningowuk of Shishmaref said. "There's hardly any land left here anymore."

Barrow, the biggest of the far northern native villages with 4,600 people, has not only had beach erosion, but early ice breakup. Hunters have been stranded at sea, and others have been forced to go far beyond the usual hunting grounds to find seals, walruses and other animals.

"To us living on the Arctic coastline, sea ice is our lifeline," Caleb Pungowigi testified recently before a Senate committee. "The long-term trend is very scary."

A 20-year resident of Barrow, Glenn Sheehan, says it seems to be on a fast-forward course of climate change.

"Mosquitoes, erosion, breakup of the sea ice, and our sewage and clean-water system, which is threatened by erosion as well," he said. "We could be going

from a \$28 million dollar sewage system that was considered an engineering model to honey buckets — your basic portable outhouses."

The people who manage the state's largest piece of infrastructure — the 800-mile-long Trans-Alaska Pipeline — have also had to adjust to rising temperatures. Engineers responsible for the pipeline, which carries about a million barrels of oil a day and generates 17 percent of the nation's oil production, have grown increasingly concerned that melting permafrost could make unstable the 400 or so miles of pipeline above ground. As a result, new supports have been put in, some moored more than 70-feet underground.

"We're not going to let global warming sneak up on us," said Curtis Thomas, a spokesman for the Alyeska Pipeline Service Company, which runs the pipeline. "If we see leaning and sagging, we move on it."

North of Fairbanks, roads have buckled, telephone poles have started to tilt, and homeowners have learned to live in houses that are more than a few bubbles off plumb. Everyone, it seems, has a story.

"We've had so many strange events, things are so different than they used to be, that I think most Alaskans now believe something profound is going on," said Dr. Glenn Juday, an authority on climate change at the University of Alaska at Fairbanks. "We're experiencing indisputable climate warming. The positive changes from this take a long time, but the negative changes are happening real fast."