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## Study shows climate changes transform Arctic region

By Faye Flam  
Inquirer Staff Writer

The most comprehensive study to date of conditions in the Arctic shows that climate change has already transformed landscapes and ecosystems through Siberia, northern Canada, Alaska, Greenland, and other far northern regions.

"The Arctic as we know it may soon be a thing of the past," said Eric Post, a biologist at Pennsylvania State University and the leader of the large, international team that put together the study, published in today's issue of the journal *Science*.

In his 20 years of fieldwork in Greenland, Post said he's seen wild rhododendrons explode across the tundra, and once-abundant herds of caribou thinning to half their previous ranks. On average, the Arctic has warmed by about 1 degree Celsius in the last few decades, and about 20 percent of the vast sheets of sea ice has melted.

While that has been known for some time, the new paper catalogs the ecological changes that have resulted.

"We're all extremely familiar with our own areas of research, but no one has had an area-wide perspective before," said Post, who was lead author on the paper. "When it's all put together, it shows how broad the changes are: plants, birds, mammals, ice and land - it's all changing everywhere."

Post has been concentrating on caribou, which he says are suffering from progressively earlier springs.

Their migration patterns used to take them to places where calves could eat fresh green shoots, he said, but now, with seasonal changes shifted, the young calves are faced with tough summer shrubs.

In addition, plants that the caribou need are crowded out by rhododendrons that have crept in with increasing heat and humidity.

Most scientists agree that carbon dioxide buildup is warming the whole planet, but it is happening two to three times faster in the Arctic. One reason is that warming in the Arctic melts snow and ice, exposing darker areas of land and decreasing the amount of sunlight being reflected away. That creates a feedback loop that can accelerate warming, said F. Stuart Chapin, an expert on Arctic ecology at the University of Alaska.

And loss of sun-reflecting ice can accelerate warming in lower latitudes as well, he said. The Arctic absorbs heat from other parts of the globe, acting as "the world's air conditioner."

Chapin, who does fieldwork in Alaska and Siberia, said he had seen more wildfires and a steady thawing of the permafrost, leading to more thaw ponds. Some of those release methane - a greenhouse gas - into the atmosphere.

"One of the things that's important about that article is showing how systematic these changes are," said Chapin, who was not involved in the *Science* paper. "It's not one thing or another changing but the whole system changing in a way that makes future change happen even faster."

The one positive change for Alaskans: Salmon have moved farther north. But overall, Chapin said, climate change is only going to add to an already alarming rate of extinctions.

Worldwide, he said, "extinction rates are 100- to 1,000-fold higher than they were before the industrial revolution." Most of those species died out because they lost their habitats to human development.

Climate change has only begun to add to this. "In my mind, we're already moving beyond extinction rates that we could consider tolerable as a society."

Penn State's Post considers the latest round of observations a harbinger. Cutting emissions can help, but climate change will still get worse, he said, "since we've already put so much carbon in the atmosphere."

That probably means more change in temperate latitudes too. "It's commonly said that the Arctic is the canary in the coal mine for changes that might come elsewhere," he said.

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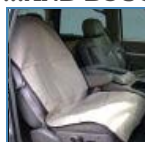
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