Climate Change on the Northern Pacific Coast

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(Note: This article was written in 2007 and refers to our Journey on the Wild Coast (/Journeys/WildCoast.html))

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Our burning of fossil fuels is spewing CO2 into the atmosphere, increasing the greenhouse effect, and warming the planet. A few degrees of temperature shift can change weather patterns across the globe - leading to storms and droughts, the melting of ice sheets, permafrost and glaciers, the loss of snow-fed water supplies, and a rise in sea level. There are a lot of good resources on the science of climate change, such as the IPCC (http://www.ipcc.ch/) (Intergovernmental Panel on Climate

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Change and RealClimate (http://www.realclimate.org/). Unchecked, this will cause a lot of problems for us and other species. Many groups and governments are working to curb our CO2 emissions. In the US, change is happening largely at the state and local level, rather than from the federal government. (http://www.pewclimate.org/docUploads/101%5FStates%2Epdf)

North warming quickly (http://www.pewclimate.org/docUploads/101%5FStates%2Epdf)

Melting Glaciers (/Issues/ClimateChange/GlacierRetreatInAlaska.html)

Northern regions of the planet are warming faster (http://data.giss.nasa.gov/gistemp/2005/) than the rest of the globe. And the icefields of coastal Alaska and British Columbia are melting more quickly (http://www.sciencemag.org/cgi/content/abstract/297/5580/382) than the rest of the world's glaciers, making an outsized contribution to sea level rise.

35,000 square miles of icefields and glaciers

Glaciers cover 35,000 square miles (90,000 square km) of Alaska and neighboring B.C., containing some of the largest areas of ice outside of Antarctica and Greenland. They're also undergoing some of the most rapid melting.

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Read more on Alaska's Melting Glaciers (/Issues/ClimateChange/GlacierRetreatInAlaska.html)…

(/photos/CRW_7434.jpg) Blockade Glacier

(/photos/BearGlacierLake.jpg)
Bear "Glacier"

Off the map

To travel through a land of melting glaciers is to walk on unmapped terrain. The USGS did much of its surveying in the 1950s, when most glaciers were far bigger than they are today. New and nameless lakes have appeared at the toes of glaciers, where the map shows only ice. Smashed trees are uncovered at the glaciers' edge, where they've been buried since the last advance of the ice.

(/photos/CaribouInSmoke.jpg) Caribou in forest fire smoke haze Forest Fires

In recent years, massive forest fires have been burning across interior Alaska during the hot dry summers. Most of our trip was in the coastal rainforest zone, which very rarely burns. But in the boreal forests on the other side of the coastal mountains, fires are frequent. In south central Alaska, the spruce bark beetle epidemic (http://www.gi.alaska.edu/ScienceForum/ASF16/1688.html) has left large areas of dead trees which are especially vulnerable. Wild fires change the balance between

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forests and grasslands - favoring the grasses. It’s possible that with global warming, increased fire may turn interior Alaska into a vast steppe (http://www.greenfacts.org/en/arctic-climate-change/l-2/4-arctic-tundra.htm#0).

 (http://www.aktrekking.com/PermafrostBig.jpg) Permafrost cliff on an arctic river

Permafrost

Most of our journey took place just beyond the edge of the permafrost zone (http://efotg.nrcs.usda.gov/references/public/ak/permafrost8_02.pdf). We passed through areas of discontinuous permafrost between Valdez and Anchorage, and in the Lake Clark (/AKMap.php#lakeClark), and Pebble Valley (/AKMap.php#pebble) areas of the Bristol Bay watershed.

Much of the north is built on frozen ground. And when the ground melts, roads buckle and buildings collapse. Industries relying on ice roads (such as the oil and gas industry on the North Slope), can operate those roads for fewer and fewer

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months per year. In Alaska, damage from warming that has already occurred is estimated to be about $35 million per year (http://www.climatehotmap.org/impacts/alaska.html).

Migration of species in response to climate change

Climate shifts change the balance between different ecosytems. When temperatures rise, forests and shrubs can move into alpine and northern realms formerly occupied only by tundra. This is already happening in both Alaska (http://www.climatehotmap.org/impacts/alaska.html), and the Pacific Northwest (http://www.climatehotmap.org/impacts/pacificnw.html). Conversely, more frequent forest fires can allow grasslands to invade formerly forested lands. As temperatures change, many plants and animals will be forced to shift their ranges. In this region, migration is made more difficult by the steep mountains and rugged topography, but the relative lack of human development across much of the area allows more room for these shifts.

(/photos/CRW_0740b.jpg) Seattle freeway

Sources of CO2 emissions in the region

This region is not only a victim, but also a perpetrator of global warming. In Washington and British Columbia, emissions come primarily from the transportation sector - cars, trucks, planes, and ships. Compared to the rest of the U.S. and Canada, energy

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generation is a less important source of greenhouse gases in the region. This is because most of the electricity comes from hydropower, rather than from coal or gas-fired plants. Hydropower doesn't emit CO2, but it has other environmental costs, particularly for salmon (/Issues/Fisheries/Salmon.html).

In Washington, about 50% of the greenhouse gas emissions come from transportation (https://courses.washington.edu/envir100/town_hall/wa_ghg.pdf), while in B.C. it's about 40% (http://www.canada.com/vancouversun/news/story.html?id=078ca5ad-e025-4ed1-b349-1d99b1fd539f&k=75335&p=3). Industry makes up most of the rest (http://cn-sbs.cssbi.ca/greenhouse-gas-emissions) of it, with resource extraction, such as fossil fuel exploration and mining making up a big chunk of that.

(/photos/CRW_7498.jpg)
Cook Inlet oil rig

In Alaska, the story's a little different. Per capita, Alaskans produce about four times more greenhouse gases than the already staggering U.S. average. Most of this comes not from individual consumption, but from power generated and used by industry - with the oil and gas industry the largest source. An additional 7% is just from methane released by oil and gas production. Transportation comes in second, mostly due to aviation. Because of Alaska's remote location, plane trips both for people and freight are longer and more frequent. One jet

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trip to the lower 48 states (per person, on a full flight) has the equivalent impact of 5,000 to 10,000 miles of driving in a single-passenger vehicle.

References and Links

- IPCC (http://www.ipcc.ch/) - Intergovernmental Panel on Climate Change
- RealClimate (http://www.realclimate.org/) - Climate scientists discussion board
- Grist (http://gristmill.grist.org/skeptics) - how to talk to a climate skeptic
- Global Warming: Early Warning Signs (http://www.climatehotmap.org/) - Map of the world with regional impacts
- Pew Center on Global Climate Change (http://www.pewclimate.org/) - analysis and policy
- Green Facts digest on Arctic Climate Change (http://www.greenfacts.org/en/arctic-climate-change/index.htm) - summaries of scientific consensus
- Global Warming in Alaska (http://www.worldviewofglobalwarming.org/pages/alaska.php) - World Wide View of Global Warming
- Glacier Mass Balance (http://en.wikipedia.org/wiki/Glacier_mass_balance) - from Wikipedia
- Global Temperature Trends (http://data.giss.nasa.gov/gistemp/2005/) - from NASA's Goddard Institute of Space Sciences
- Alaska Conservation Solutions (http://www.alaskaconservationsolutions.com/acs/index.php) - global warming in Alaska
- Anchorage Daily News article on Alaska CO2 emissions (http://www.adn.com/news/environment/story/8645245p-8536989c.html) - February 2007

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- Rapid Wastage of Alaska Glaciers and Their Contribution to Rising Sea Level (http://www.sciencemag.org/cgi/content/abstract/297/5580/382) - from Science, subscription required
- Glacier changes in southeast Alaska and northwest British Columbia and contribution to sea level rise (http://www.agu.org/journals/jf/jf0701/2006JF000586/) - from Journal of Geophysical Research, subscription required
- Ecological Responses to Recent Climate Change (http://www.nature.com/nature/journal/v416/n6879/full/416389a.html) - from Nature, subscription required

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