



## Long-term warming and environmental change trends persist in the Arctic in 2013

Though not as extreme as last year, new report by NOAA and partners finds that the Arctic continues to show evidence of a shift to a new warmer, greener state

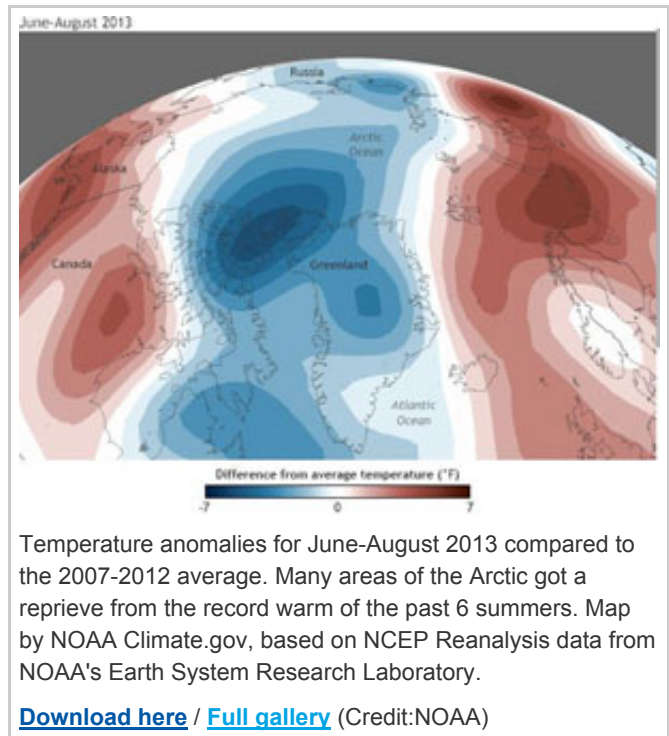
December 12, 2013

According to a new report released today by NOAA and its partners, cooler temperatures in the summer of 2013 across the central Arctic Ocean, Greenland and northern Canada moderated the record sea ice loss and extensive melting that the surface of the Greenland ice sheet experienced last year. Yet there continued to be regional extremes, including record low May snow cover in Eurasia and record high summer temperatures in Alaska.

“The Arctic caught a bit of a break in 2013 from the recent string of record-breaking warmth and ice melt of the last decade,” said David M. Kennedy, NOAA’s deputy under secretary for operations, during a press briefing today at the American Geophysical Union annual meeting in San Francisco. “But the relatively cool year in some parts of the Arctic does little to offset the long-term trend of the last 30 years: the Arctic is warming rapidly, becoming greener and experiencing a variety of changes, affecting people, the physical environment, and marine and land ecosystems.”

Kennedy joined other scientists to release the [Arctic Report Card 2013](#), which has, since 2006, summarized changing conditions in the Arctic. One hundred forty-seven authors from 14 countries contributed to the peer-reviewed report. Major findings of this year’s report include:

- **Air temperatures:** While Eurasia had spring air temperatures as much as 7°F above normal, central Alaska experienced its coldest April since 1924 with birch and aspen trees budding the latest (26 May) since observations began in 1972. Summer across a broad swath of the Arctic was cooler than the previous six summers, when there had been pronounced retreat of sea ice. But Fairbanks, just below the Arctic Circle in Alaska, experienced a record 36 days with temperatures at or exceeding 80°F.
- **Snow cover:** The snow extent in May and June across the Northern Hemisphere (when snow is mainly located over the Arctic) was below average in 2013. The North American snow cover during this period was the fourth lowest on record. A new record low was reached in May over Eurasia.
- **Sea ice:** Despite a relatively cool summer over the Arctic Ocean, the extent of sea ice in September 2013 was the sixth lowest since observations began in 1979. The seven lowest recorded sea ice extents have occurred in the last seven years.
- **Ocean temperature and salinity:** Sea surface temperatures in August were as much as 7°F higher than the long-term average of 1982-2006 in the Barents and Kara Seas, which can be attributed to an early retreat of sea ice cover and increased solar heating. Twenty-five percent more heat and freshwater is stored in the Beaufort Gyre, a clockwise ocean current circulating north of Alaska and Canada, since the 1970s.
- **Greenland ice sheet:** During a summer when air temperatures were near the long-term average, melting occurred across as much as 44 percent of the surface of the Greenland ice sheet, close to the long-term average but much smaller than the record 97 percent in 2012.



- **Vegetation:** The Arctic is greening as vegetation responds to warmer conditions and a longer growing season. Since observations began in 1982, Arctic-wide tundra vegetation productivity (greenness) has increased, with the growing season length increasing by 9 days each decade.
- **Wildlife:** Large land mammal populations continued trends seen over the last several decades. Muskox numbers have increased since the 1970s, in part due to conservation and introduction efforts, while caribou and reindeer herds continue to have unusually low numbers.

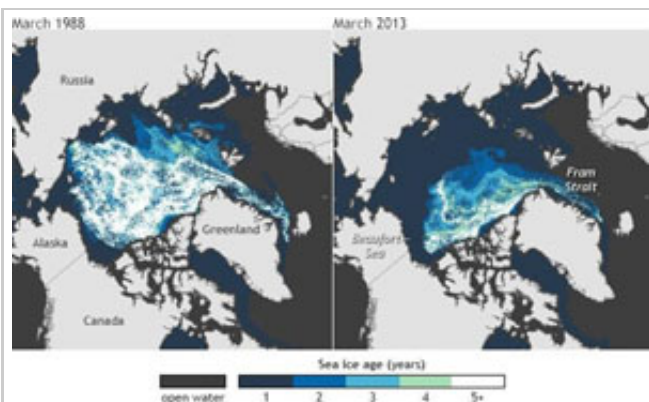
For the first time, scientists also released new information on marine fishes and black carbon. Highlights:

- **Marine fishes:** The long-term warming trend, including the loss of sea ice and warming of waters, is believed to be contributing to the northward migration into the Arctic of some fish such as Atlantic mackerel, Atlantic cod, capelin, eelpout, sculpin and salmonids.
- **Black carbon:** While black carbon (soot) originating from outside the Arctic has decreased by 55 percent since the early 1990s, primarily due to economic collapse in the former Soviet Union, increasing numbers of wildfires fueled by greater amounts of vegetation in a warmer, drier climate, have the potential to increase atmospheric black carbon in the high latitudes.

“The Arctic Report Card presents strong evidence of widespread, sustained changes that are driving the Arctic environmental system into a new state and we can expect to see continued widespread and sustained change in the Arctic,” said Martin Jeffries, principal editor of the 2013 Report Card, science adviser for the U.S. Arctic Research Commission, and research professor at the University of Alaska Fairbanks. “But we risk not seeing those changes if we don’t sustain and add to our current long-term observing capabilities. Observations are fundamental to Arctic environmental awareness, government and private sector operations, scientific research, and the science-informed decision-making required by the U.S. National Strategy for the Arctic.”

In 2006, NOAA’s Climate Program Office introduced the State of the Arctic Report which established a baseline of conditions at the beginning of the 21st century. It is updated annually as the Arctic Report Card to document the often-quickly changing conditions in the Arctic. To view this year’s report, visit <http://www.arctic.noaa.gov/reportcard/>.

NOAA’s mission is to understand and predict changes in the Earth’s environment, from the depths of the ocean to the surface of the sun, and to conserve and manage our coastal and marine resources. Join us on [Facebook](#), [Twitter](#), [Instagram](#) and our other [social media channels](#).



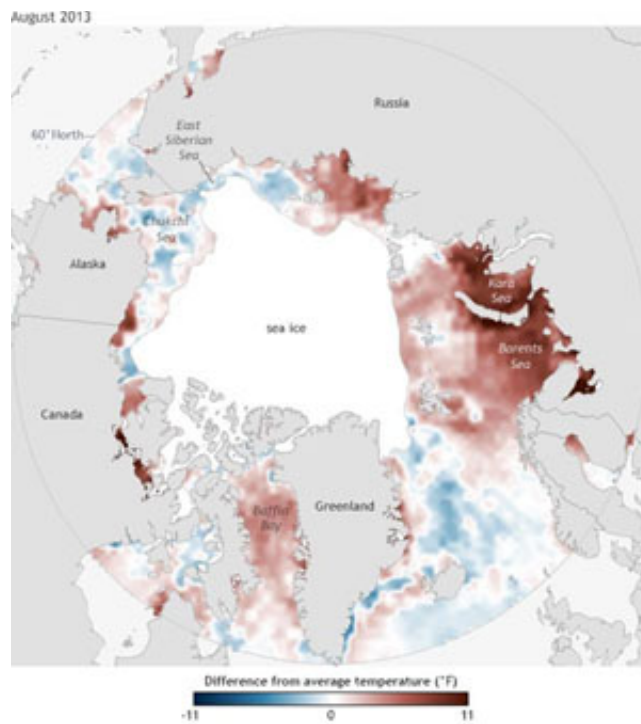
Age of ice at the end of March 1988 compared to March 2013. Category 1 is first year ice--ice that has survived one summer melt season. In March 2013 at the winter maximum, 78% of the Arctic ice pack was only one year old, while only 7% was old (4+ years), thick ice. Map by NOAA Climate.gov, based on data provided by Mark Tschudi, University of Colorado.

[Download here](#) / [Full gallery](#) (Credit:NOAA)



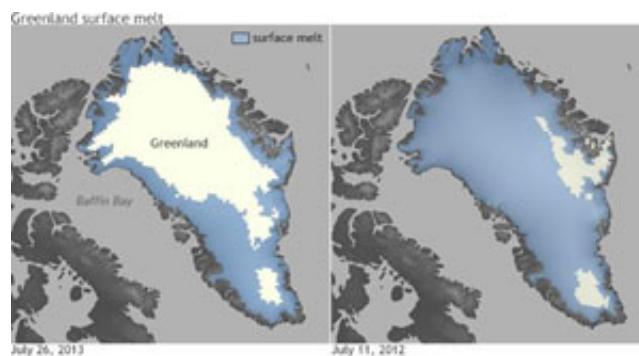
Satellite-based change in vegetation greenness at the peak of the growing season in the Arctic between 1982-2012. Greener Arctic tundra of recent past likely to be the new normal. Map by NOAA Climate.gov, based on AVHRR data provided by Uma Bhatt, University of Alaska-Fairbanks.

[Download here](#) / [Full gallery](#) (Credit:NOAA)



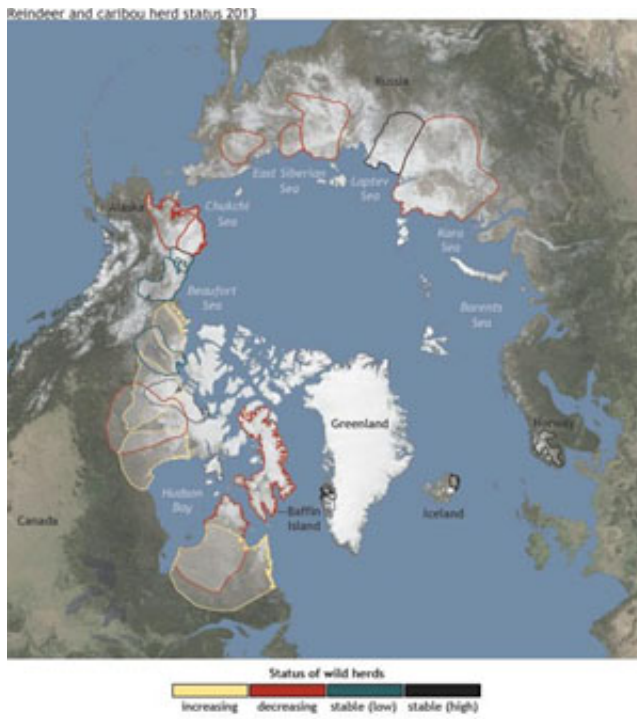
Sea surface temperatures in August 2013 compared to the 1982-2006 average and sea ice extent (areas with 15% or more ice cover, solid white). Arctic boundary waters warmer than average in summer 2013; the Arctic Ocean and adjacent waters are becoming more hospitable to species from lower latitudes. Map by NOAA Climate.gov, based on data provided by Wendy Ermold and Mike Steele, University of Washington.

[Download here](#) / [Full gallery](#) (Credit:NOAA)



Maximum melt extent on the Greenland Ice Sheet on July 26, 2013 (left), and July 11, 2012 (right), the summer peaks for each respective year. Melt area was 44% at the peak melt in 2013, compared to 97% in 2012. The surface melt on the ice sheet is back near average for 2013. Maps by NOAA Climate.gov, based on data provided by Thomas Mote, University of Georgia.

[Download here](#) / [Full gallery](#) (Credit:NOAA)



The winter ranges of many reindeer and caribou herds are smaller than they used to be and many populations have unusually low numbers. This map depicts the annual range of 24 migratory reindeer and caribou herds and their population status. Map by NOAA Climate.gov, based on data provided by Don Russell and Kim Poole, CARMA project.

[Download here](#) / [Full gallery](#) (Credit:NOAA)