Good morning, everybody. I'm Martin Jeffries, one of three editors of the Arctic Report Card. I'm also a program officer for Arctic and Global Prediction at the Office of Naval Research, and a Professor of Geophysics at the University of Alaska Fairbanks. I'm pleased to welcome you today to the official release of the 2012 update to the Report Card.

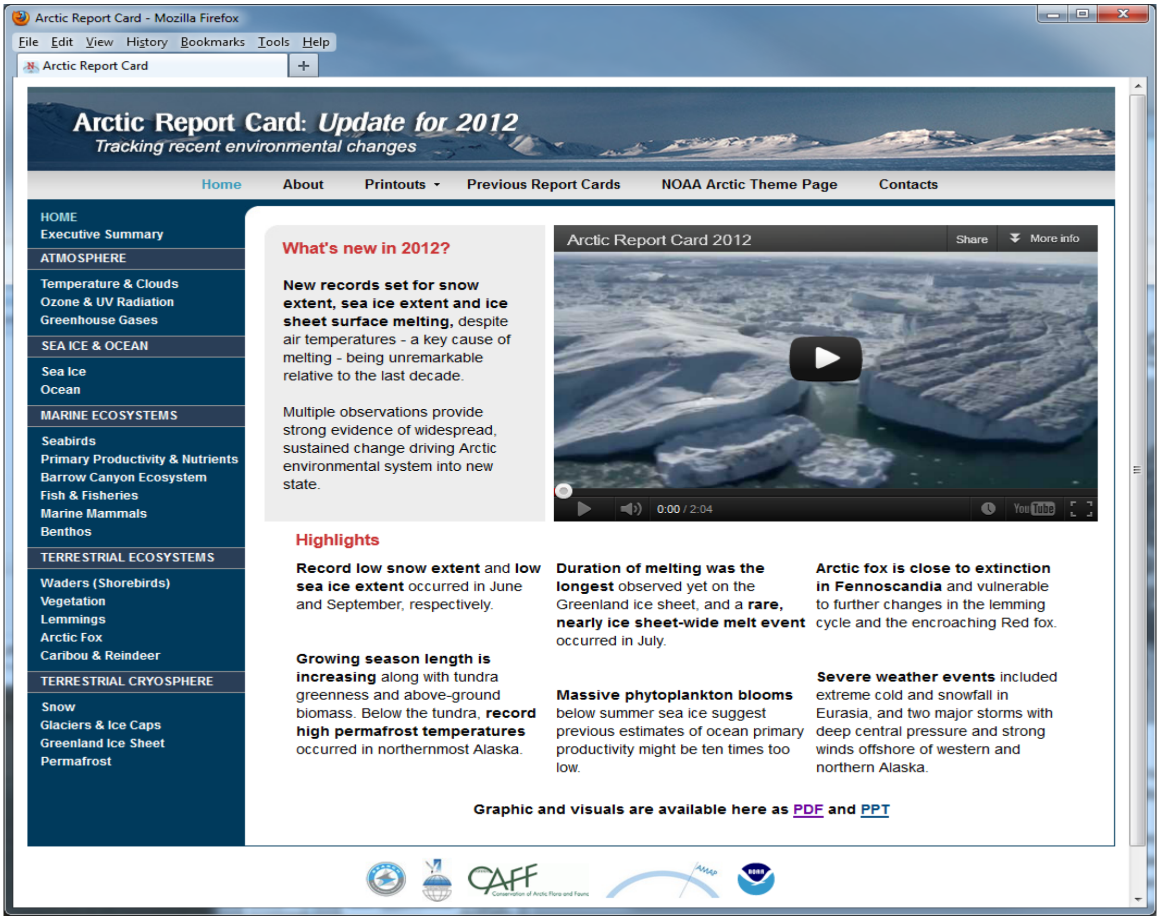
I thank Dr. Lubchenco for her introductory remarks, and also my co-editors, Jackie Richter-Menge of the Cold Regions Research and Engineering Laboratory, and Jim Overland, of the NOAA Pacific Marine Environmental Laboratory. Also on the panel with us are Dr. Jason Box of the Byrd Polar Research Center at The Ohio State University, and Dr. Don Perovich of Dartmouth College. They will talk about the Greenland ice sheet and sea ice, respectively.

Before we describe some highlights of Report Card 2012 and then take your questions I'll provide some background on this Web-based publication.

Sponsored by the Arctic Research Program in the NOAA Climate Program Office, this is the sixth annual update to the Report Card, which was first published in 2006. This year's report is the work of a large international team of scientists: a record 141 authors from 15 different countries prepared 20 essays describing the state of different components and key indicators of the Arctic environmental system.

The essays are organized into 5 sections: Atmosphere; Sea Ice and Ocean; Marine Ecosystem, Terrestrial Ecosystem; and Terrestrial Cryosphere. The Circumpolar Biodiversity Monitoring Program of the Conservation of Arctic Flora and Fauna (CAFF) Working Group of the Arctic Council was instrumental in soliciting many of the ecosystem essays in the Report Card. All twenty essays were subject to independent peer-review organized by the Arctic Monitoring and Assessment Programme (AMAP) of the Arctic Council. Thank you, CAFF and AMAP.

Key highlights from the essays are presented on the front page of the Web site, where you’ll also find a video that summarizes Report Card 2012.



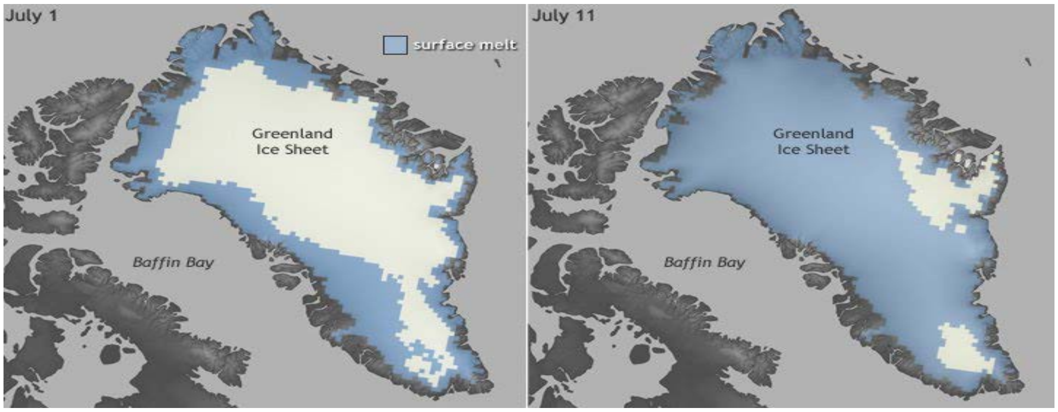
http://www.arctic.noaa.gov/reportcard/

So, what do we have to report about the Arctic this year?

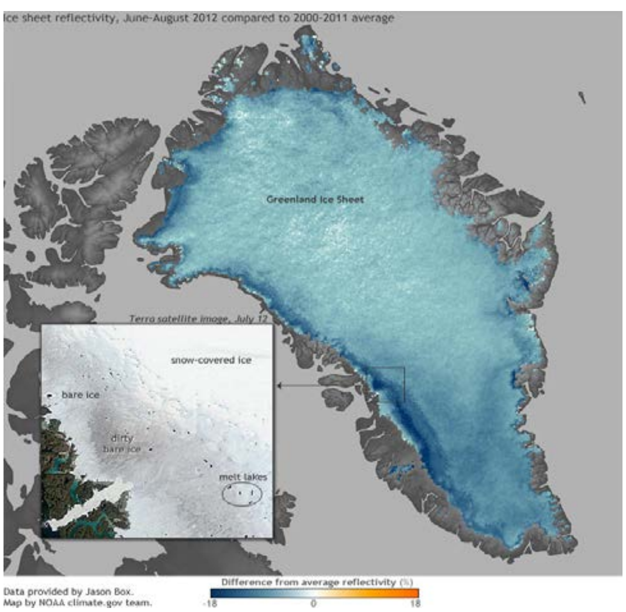
A key feature of 2012 was that, with the exception of one or two episodes, Arctic-wide air temperatures were unremarkable in the context of the last decade, yet there was continuing and significant change in the cryosphere – the frozen world – which saw new records for low snow extent, low sea ice extent, extended duration and vast extent of ice sheet surface melting, and high permafrost temperatures.

Jason, would you tell us what's been happening to the Greenland Ice Sheet?

In 2012, Greenland ice sheet changes accelerated with record setting surface melting, ice area and volume losses. The duration of surface melting in 2012 was the highest since satellite observations began in 1979, and extensive surface melting was documented for the first time at the highest ice sheet elevations. The extensive melting was promoted by persistent southerly air flow into western Greenland associated with a sixth consecutive and record-setting negative summer North Atlantic Oscillation (NAO) index. The lowest ice surface reflectivity (also referred to as albedo) observed in 13 years of high quality satellite observations since 2000 is both a consequence of the unusual warmth and a self-reinforcing feedback that amplifies surface melting. Also promoting maximum melting, persistent high pressure over the ice sheet reduced summer snowfall that would have otherwise limited melting by blanketing the surface with highly reflective fresh snow. Marine-terminating glaciers collectively lost an area more than twice the average annual loss rate of the previous 11 years, mainly due to losses from the northern ice shelves. Finally, according to GRACE gravity retrievals, during 2008-2012 the rate of ice mass loss and its contribution to sea level rise were double those of the period 2002-2006.



Surface melt in early & mid-July, 2012.

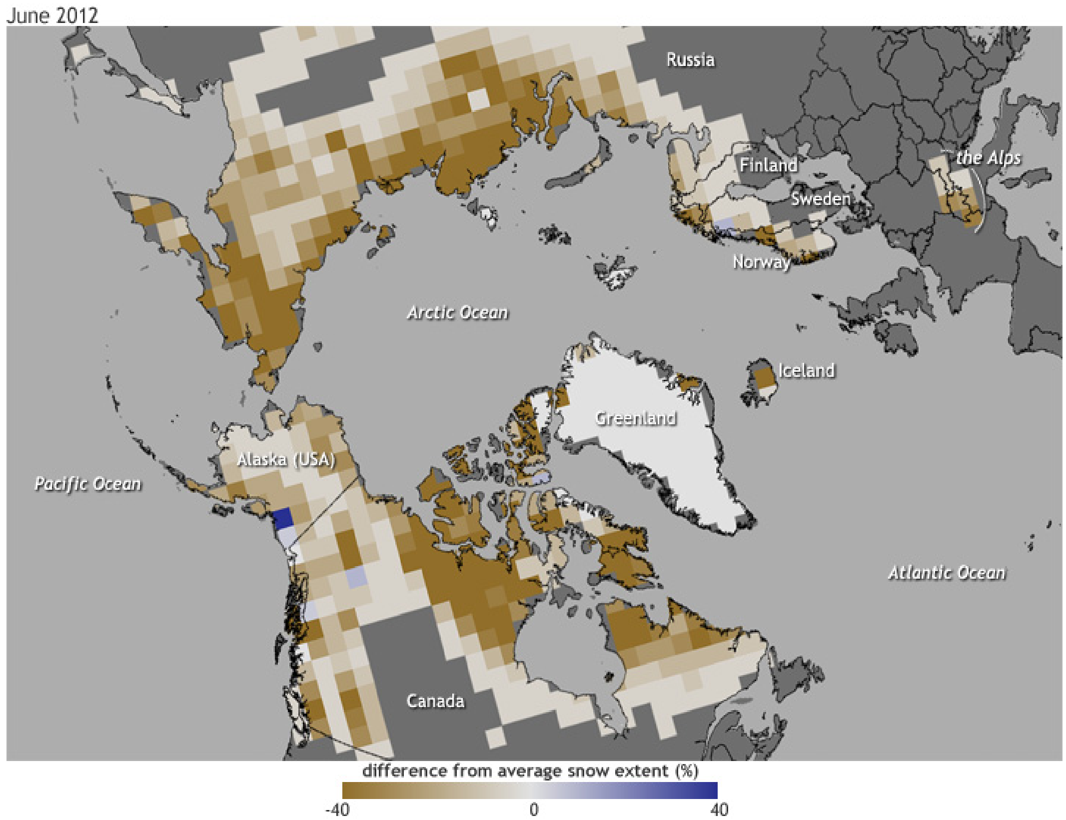


Percent sunlight reflected by Greenland Ice Sheet from June-August 2012, compared to 2001-2010.

Snow is the essential ingredient of an ice sheet, and of the smaller ice caps and glaciers. Adjacent to the glaciated regions, snow covers the land surface for many months each year, but there is strong evidence that the areal extent of the snow cover is declining rapidly at a critical time of year – that is, in spring (May and June).

Successive records for the lowest June snow cover extent have been set each year since 2008 in Eurasia, and in 3 of the past 5 years in North America. And, it’s noteworthy that the rate at which June snow extent has decreased since 1979 (-17.6% per decade) is greater than the rate at which September sea ice extent has decreased (-13% per decade) during the same period.

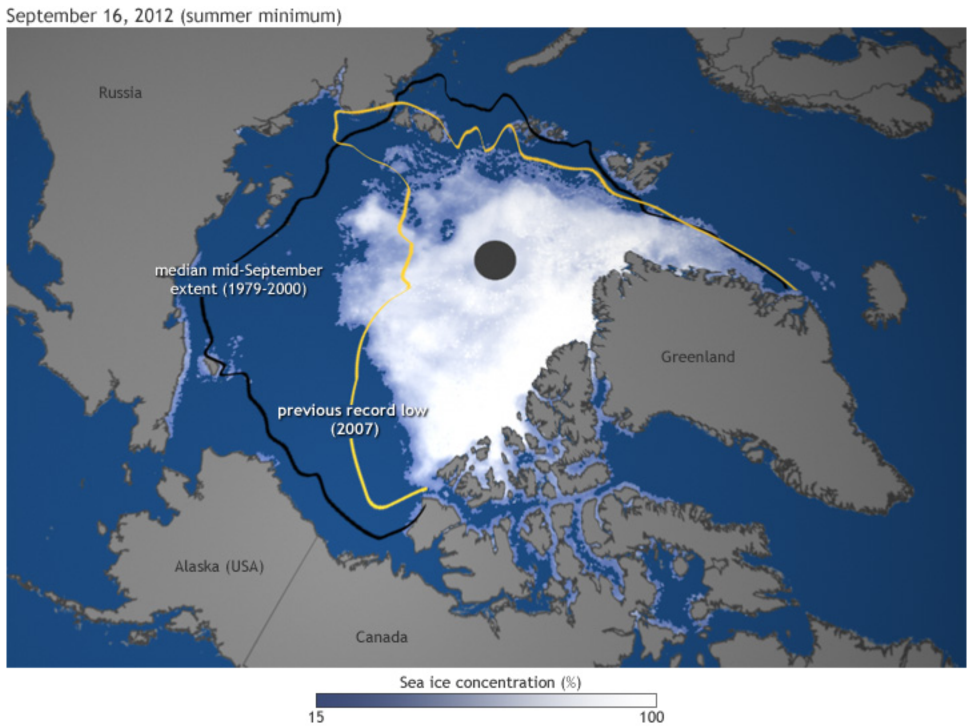
Snow is a highly reflective material, as anyone who has been out in the snow without sunglasses or goggles can attest. The loss of spring snow cover is critical because it exposes the darker, much less reflective land surface earlier to solar radiation, i.e., to the sun and its warmth. The same applies to the retreat of the sea ice and exposure of the darker ocean.



Difference from average snow cover extent in the Northern Hemisphere in June 2012 compared to 1971-2000.

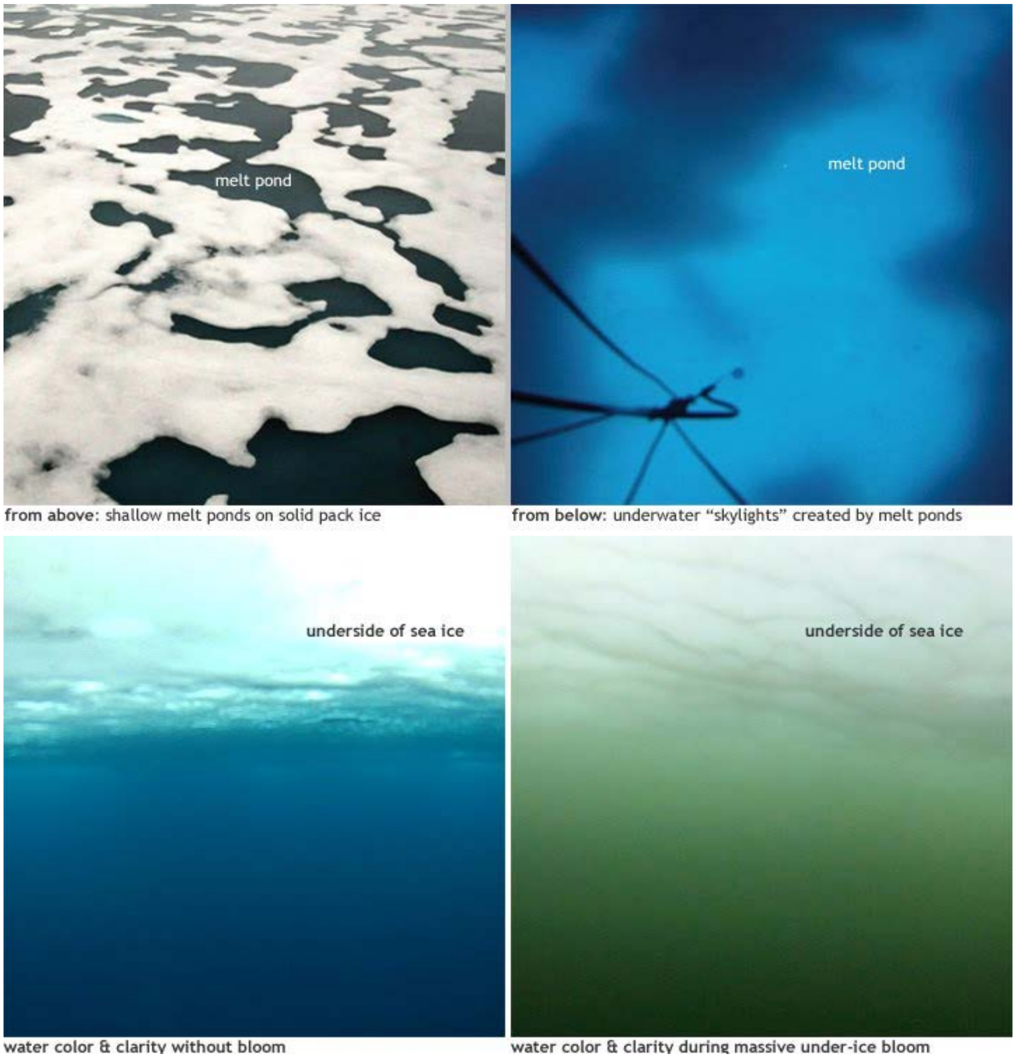
Don, would you tell us what's been happening to sea ice?

It was an eventful year for the Arctic sea ice cover. At the end of winter in March, the overall the extent of the ice cover was relatively large and there was a particularly extensive ice cover in the Bering Sea. But this all changed during the summer melt season. From March to September 2012, we witnessed the largest decline, from late winter maximum to late summer minimum, of sea ice extent in the 33-year satellite record. This culminated in September in the smallest ice extent yet, and which was less than half the average value observed from 1979 to 2000. August 2012 was a period of exceptionally rapid ice decline, with large losses occurring in the East Siberian and Chukchi seas during an intense storm in early August. The past six years have had the six smallest September ice extents since observations began in 1979, showing that Arctic sea ice has not recovered from the large and unexpected decrease observed in 2007. The shift from older, thicker ice to thinner, younger ice continued. The continued decline in sea ice is indicative of a shift to a new state of reduced sea ice coverage. This new state of the sea ice cover has implications for other components of the Arctic system, particularly the marine ecosystem, and even the terrestrial ecosystem.



Sea ice extent on September 16, 2012.

Sea ice is a vital component of the marine ecosystem, and, as the ice has retreated and the age – a proxy for thickness – has decreased, unexpectedly massive phytoplankton blooms have been observed below the ice in summer. Consequently, it's been suggested that previous estimates of annual primary production may be about 10-times too low. Primary productivity is also increasing on land; the tundra, immediately adjacent to the expanding area of open ocean in summer, is seeing an increase in biomass, greenness, length of growing season and summer warmth.



Melt ponds on the ice surface act as skylights, illuminating the underside of the ice and promoting phytoplankton blooms.

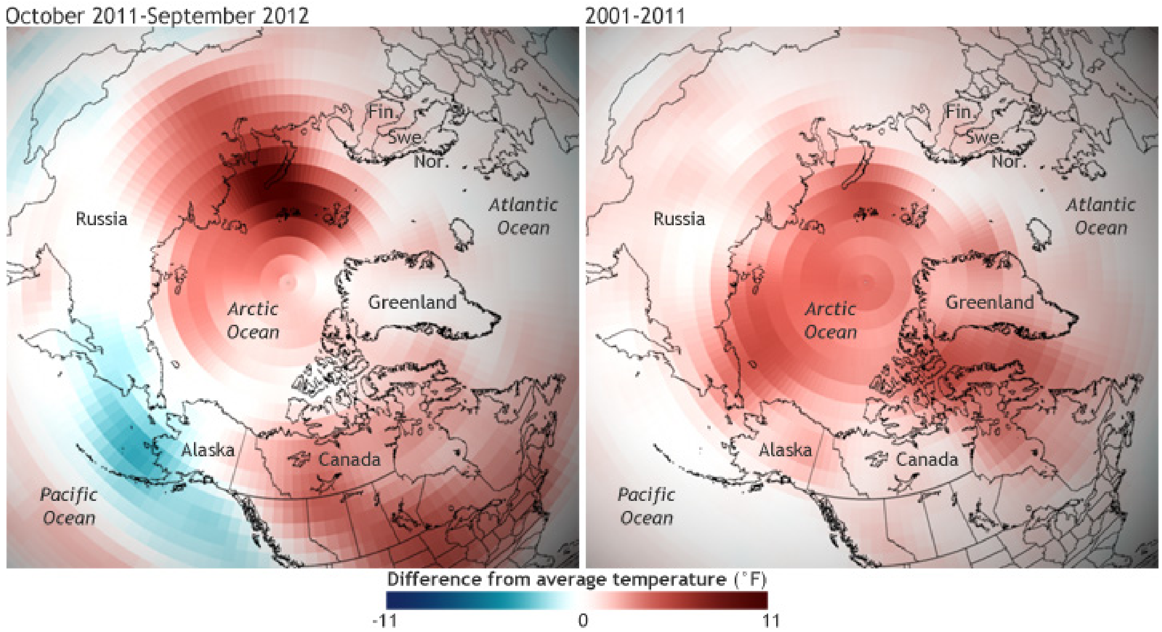
The combination of greater summer warmth following the earlier retreat of the snow cover in spring is probably a factor in the increase in permafrost temperature below the tundra land surface. For example, in 2012, record high temperatures were recorded at 20 m below the surface at eight of the ten permafrost observatories that have been monitored annually since 1983 on the North Slope of Alaska. At the other two observatories, the temperature at 20 m depth remained the same as in 2011, a year when record high temperatures occurred at those two locations.

Permafrost and snow are integral components of the tundra ecosystem. One of the keystone species of that ecosystem – the lemming, a small rodent – is also showing signs of change. There is evidence that the previous, roughly 4-year, regularity of the lemming cycle is decaying, i.e., lengthening, and cycle amplitude has collapsed to relatively low population densities in some regions. A link between changes in the lemming population cycle and changes in the characteristics of the snow has been suggested.

One animal that is directly affected by changes in lemming populations is the Arctic fox. In Europe, the Arctic fox population has declined to near extinction due to failure to recover from over-harvesting at the start of the 20th Century and the recent absence of lemming peaks. The Arctic fox remains abundant in North America, but here and in Europe the larger Red fox has been expanding its range northward, leading to predation on and increased competition with the Arctic fox for food resources.
So, how to sum up the current state of the Arctic?

First, multiple observations provide strong evidence of widespread, sustained changes that are driving the Arctic environmental system into a new state. A major source of the momentum for this rapid transition is the combined effect of the changes being observed in the snow cover, sea ice, glaciers and the Greenland ice sheet.

Those very visible components of the cryosphere are conspiring to reduce the overall surface reflectivity of the region in the summer, when the sun is ever-present. In other words, bright, white surfaces that reflect summer sunlight are being replaced by darker surfaces, e.g., ocean, land and melting ice, which absorb sunlight. This darkening of the surface increases the capacity to store heat within the Arctic system, which enables more melting – a positive feedback (or, a self-reinforcing cycle). This explains why the Arctic continues to grow warmer by a factor of two or more than lower latitudes, the so-called *Arctic Amplification* of global warming.



Arctic amplification, i.e., relative to long-term averages, air temperatures are rising faster in the Arctic than at lower latitudes

Second, we are seeing profound changes in both the marine and terrestrial ecosystems, and increasing evidence of strong connections between those ecosystems. For example, the increasing duration of the open water season and decline in summer sea ice extent in the Arctic Ocean are (1) affecting marine primary productivity, namely the abundance and composition of phytoplankton communities, and (2) contributing to greater summer warmth in the tundra regions, where primary productivity is increasing and peak productivity is occurring earlier.

In conclusion, if we are not already there, we are surely on the verge of seeing a new Arctic. We can expect to see continued widespread and sustained change, with new record lows and highs, throughout the Arctic environmental system. And, since the Arctic is not isolated from the global environmental system, indeed it is an integral and vital part of that system, we can expect to see Arctic Change have global environmental and socio-economic consequences.

That concludes the 2012 update to the Arctic Report Card.

I'll now open it up to Q&A, and note that some other authors are here in the room and on the phone to help answer your questions.

Thank you.