Statement of
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Thank you Chairman Murkowski, Ranking Member Cantwell, and Members of the Committee. I appreciate the opportunity to discuss Arctic climate change and new frontiers in Arctic environmental research with you today.

The climate has changed in many ways across the globe since pre industrial times. Global mean surface temperature has warmed about 1.5 F. The pace and characteristics of climate change are consistent with the scientific understanding of the climate response to human activities.

For a region of its size, the Arctic has experienced the fastest surface warming on Earth. In addition, the subsurface of the Arctic Ocean is warming faster than anywhere else in the world's oceans.

When I was a graduate student first looking at the sea ice extent record from satellites, the record was half as long as it is now. We knew then that the sea ice extent was retreating, but the limited observations available did not signal the rapid decline in summer sea ice that we know today.

Now with expanded observations and understanding we have developed global earth system models with historical simulations of Arctic sea ice loss in good agreement with reality. These models predict the Arctic will be nearly sea ice-free at the end of summer roughly by midcentury.

I have emphasized the loss of Arctic sea ice because it is an amplifier of climate change. And air warmed over the sea ice is transported towards the surrounding land.

Warmer air over the Arctic in winter increases the likelihood of freezing rain and rain on snow, both can significantly disrupt mobility of humans and animals. Subsistence hunters suffer twice with difficulty traveling and a diminished animal population to hunt.

Thawing permafrost can damage roads and buildings, and lead to greater particulate runoff into rivers and into the Arctic Ocean, changing ocean chemistry and affecting fish and marine mammals.

Atmosphere and ocean warming are causing land ice mass loss, which is the highest contributor to observed global sea level rise today. Greenland alone contributes about ¼ of the global sea level rise.

Arctic coastal villages are threatened by rapid coastal erosion from a combination of thawing permafrost, and greater wave heights and worse storm surges due to reduced sea ice.

In July 2007, I was an instructor at a course on sea ice that was an activity of the International Polar Year. More than 100 students and instructors were gathered in an Arctic village. We had grown accustomed to the sea ice setting records. Though with the evidence surrounded us, no one during the course predicted that in two months, September 2007 would shatter the previous record low by 20%.

Today I co-lead a community effort known as the Sea Ice Prediction Network, which coordinates and leads scientists worldwide to improve sea ice prediction from a few weeks to a few years in advance. Our predictions systems must blend the methods used to predict weather and longer-term climate signals.

Weather forecasting has a half-century lead on sea ice prediction. There is much more we can do to make these systems realize their full potential. With continued investments in observations and research, I believe we could forecast optimal shipping routes and give coastal communities advanced notice of offshore sea ice type and the potential for damaging waves.

Our earth system models today have the capacity to produce wide-ranging information beneficial to society, such as chemical cycling, near-shore sea ice conditions, and biologic productivity.

Arctic scientists are actively exploring the extent to which a changing Arctic can influence the lower latitudes, with longer lasting cold air outbreaks as one possibility. Our European colleagues have found that when their models included a more realistic Arctic, forecasts improve in lower latitudes.

Sustained observations are essential to our ability to predict the Arctic environment. Observations at a process level and across the Arctic are needed. An observing network of the Arctic Ocean, sea ice, and surrounding land is challenging to construct, but the pay off is clear.

Investment in Arctic research is essential to a safe and productive future for us all. Universities are a key player in Arctic research because they offer scientific excellence and expertise in wide ranging areas that are essential to new discoveries and progress in Arctic science. University scientists are uniquely able to include undergraduate students in the research program and educate a large population about the Arctic.

The University of Washington has taken a leadership position in Arctic research, building exceptional depth and breadth in the natural and social sciences and policy. We are investing in an even stronger program with our Future of Ice Initiative, through new investments in faculty and facilities to accelerate research. We have a new Arctic Studies minor and a graduate seminar that introduces students to interdisciplinary, policy-relevant themes. Our program is a model for investments that could be made in Arctic Studies.