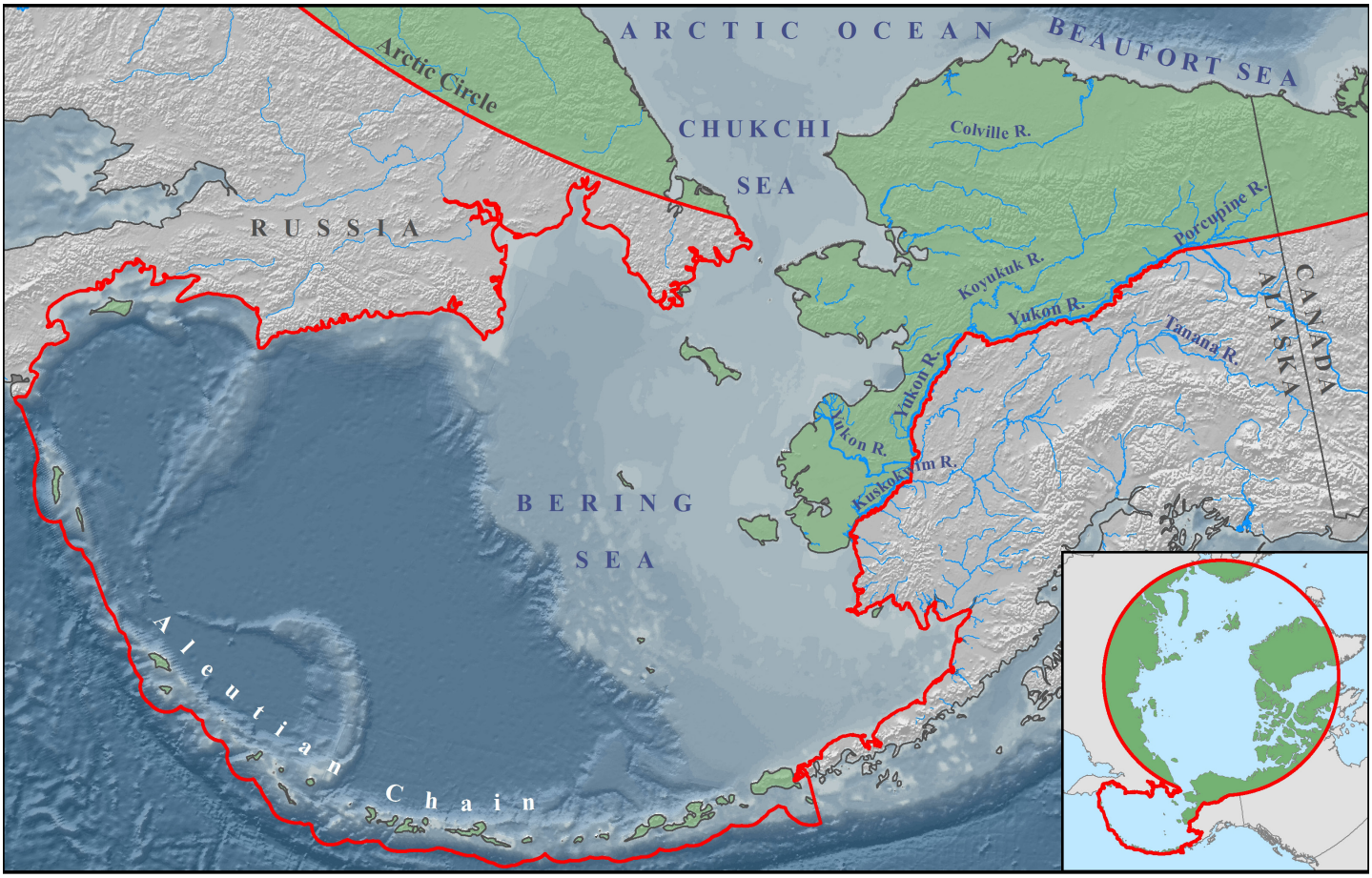
ABOUT DEPARTMENT OF ENERGY ARCTIC SCIENCE

WHAT IS THE ARCTIC?

The Arctic Research and Policy Act defines the Arctic as all United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and Beaufort, Bering, and Chukchi Seas.

Arctic Boundary as defined by the Arctic Research and Policy Act (ARPA)

All United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering and Chukchi Seas; and the Aleutian chain.[1]



Acknowledgement: Funding for this map was provided by the National Science Foundation through the Arctic Research Mapping Application (armap.org) and Contract #0520837 to CH2M HILL for the Interagency Arctic Research Policy Committee (IARPC).
Map author: Allison Gaylord, Nuna Technologies. May 27, 2009.

1. The Aleutian chain boundary is demarcated by the 'Contiguous zone' limit of 24-nautical miles.

WHAT ARE THE TOP SCIENTIFIC CHALLENGES FACING THE ARCTIC?

The environment of the Arctic is changing faster than in any other region on the planet. The changes taking place in the Arctic have global impacts. Diminished physical and geopolitical barriers to resource access and extraction are presenting economic and strategic possibilities. Arctic residents are faced with rapidly changing conditions that challenge health, safety, and cultural practices.

The U.S. Arctic Research Commission identified five goals to address the above challenges:

1. Advance Arctic Infrastructure
2. Assess Arctic Natural Resources
3. Observe, Understand, and Forecast Arctic Environmental Change
4. Improve Community Health and Well-Being
5. Enhance International Scientific Cooperation in the Arctic

WHAT ARE SOME ARCTIC SCIENCE CHALLENGES THE DEPARTMENT OF ENERGY IS ADDRESSING?

The Department of Energy is the largest funder of physical science research in the United States. Department of Energy Arctic research support spans earth science, ocean science, electrical grid and energy systems, space science, and more. The Department of Energy's Office of Science advances climate change research to provide knowledge of effects of greenhouse gas emissions on Earth's climate and biosphere. In the Arctic, DOE supports modeling and prediction, including the Regional Arctic System Model; atmospheric system research, including Atmospheric Radiation Measurement facilities on the North Slope of Alaska; the Interdisciplinary Research for Arctic Coastal Environments (InteRFACE); and the Next Generation Ecosystem Experiment (NGEE) - Arctic. The goal of the NGEE project is to improve climate model predictions through advanced understanding of coupled processes in Arctic terrestrial ecosystems. Learn more about NGEE-Arctic at https://ngee-arctic.ornl.gov/summary

THE AURORA

The Aurora Borealis (Northern Lights) are the result of electrons colliding with the upper reaches of Earth's atmosphere. The accelerated electrons follow the magnetic field of Earth down to the Polar Regions where they collide with oxygen and nitrogen atoms and molecules in Earth's upper atmosphere. In these collisions, the electrons transfer their energy to the atmosphere thus exciting the atoms and molecules to higher energy states. When they relax back down to lower energy states, they release their energy in the form of light. This is similar to how a neon light works. The aurora typically forms 80 to 500 km above Earth's surface.
The accelerating electrons of the aurora create large currents that can couple into ground electric systems through geomagnetically induced currents. The aurora can also cause impacts on polar communications, GPS signals, and even satellites in orbit. The aurora is part of a global electric circuit which includes a cross polar voltage which may exceed 200 kiloVolts and have current systems of over 100,000 Amps. An analysis by Lloyds of London showed that a major solar storm could cause major disruptions to the US power grid and cost ~$2.5T. The Department of Energy supports research on the aurora and its impacts on electrical grid to improve United States preparedness and resiliency.