Chugach National Forest: A Laboratory for Understanding Climate Change

Key Message

Alaska is ground zero for climate change, and the Chugach National Forest is a focal point on the melting edge for researchers, educators, and students around the world seeking to understand the potential physical, biological and socio-economic impacts. General circulation models predict that the Chugach will experience greater increases in temperature than points south. Consequently, the forest's world famous glaciers (covering nearly 35% of the landscape); 96 watersheds (including the Copper River Delta, the largest contiguous wetlands complex on North America's Pacific coast); and, the coastline and waters of Prince William Sound (one of the most studied ecosystems in the world) draw intense international attention and scientific inquiry. Relatively little of this forest is heavily modified by human activity, providing a natural baseline to assess the impacts of environmental change. The Chugach is actively working with these interested parties to develop an improved scientific knowledge base that strengthens our understanding of climate change used to inform our management activities on this globally significant landscape.

Background

The ecosystems of the Chugach are still responding to naturally changing climatic conditions since the last glacial period about 10,000 years ago, and current changes need to be interpreted in that context. In addition, other natural events such as the 1964 earthquake have brought about significant natural modifications to the ecosystem. Some specific changes have been observed in and around the Chugach that may have a connection to global climate change:

- *A spruce beetle infestation* killed the majority of mature spruce trees across more than one million acres on the Kenai Peninsula, of which greater than 100,000 impacted acres are on the Chugach. Unusual climatic conditions coupled to a large diameter mature susceptible host population set the stage for this beetle outbreak of unprecedented scale.
- *Wetlands are drying* on the Kenai, in the lowlands off the Forest. Closed-basin lake levels have declined by as much as 3.25 feet and many ponds have converted to grassy pans with spruce and hardwood invasion. Wetland areas that were peat dominated for thousands of years have been heavily invaded by ericaceous shrubs and dwarf birch in recent decades.
- *Glacier retreat and thinning have accelerated*. The Harding Icefield lost 70 vertical feet and 5% in surface area in the last 50 years. The Columbia Glacier, the second largest tidewater glacier in North America, has retreated approximately 8 miles over the past 20 years and thinned dramatically. Spencer Glacier, which can now be visited through the new Whistle Stop rail service, has retreated more than three miles since the rail tracks were laid around 1920. Hikers today walk the path of this retreat to the glacier's base.
- *Treeline has risen* over 3 feet per year on average in the Kenai Mountains during the past 5 decades.

In addition, ecologists, biologists and our publics are concerned about potential impacts of climate change, such as:

- Invasive species, relatively rare within natural communities on the Forest at this time, will become ever more dominate components of forest ecosystems with subsequent effects on biological diversity, fire regime, and hydrology.

- Hydrological changes and warming waters will affect salmon fisheries and spawning habitat.
- Changes in vegetation composition and structure will change the capability to support certain wildlife or plant species.
- Sea level rise and isostatic rebound will both have effects on coastal wetlands and shoreline associated species.
- Native insects will spread into previously uninfested forests made susceptible by changing climate conditions.

Current Situation and Efforts

Research and Monitoring:

The Wolverine Glacier Research Natural Area (RNA) was designated in the Record of Decision for the Revised Forest Plan in 2002. Wolverine Glacier is one of three long-term glacial monitoring sites established in North America by the U.S. Geological Survey. The data collected are instrumental to understanding glacier-related hydrologic processes, hazards, and climate change. The monitoring site has been in continual operation since1966, and provides an invaluable data source on glacial movement, mass balance, and stream runoff. A weather station is also on-site, providing the only high-altitude, long-term, year-round climate data for the mountains of south-central Alaska. An extensive body of scientific literature has been generated from this research. The RNA is located on the Kenai Peninsula in southcentral Alaska on the Glacier Ranger District of the Chugach National Forest, and is about 25 miles northeast of the city of Seward. For more information see: http://ak.water.usgs.gov/glaciology/wolverine/index.html; and, http://fs.usda.gov/Internet/FSE_DOCUMENTS/fsm8_028808.pdf

The Copper River Delta, located on the Cordova Ranger District, stretches across 700,000 acres and drains a watershed of 26,500 square miles, an area about the size of West Virginia. The Copper River presents a unique opportunity to watch evolution at work—to study the dynamics of environmental change, adaptation, and productivity. The Cordova Ranger District has been coordinating a number of studies that potentially hold clues for climate research:

- Wetland productivity and change in wetland ponds due to uplift from the 1964 earthquake and climate: The inquiry stems from the rapid vegetation succession that is occurring in both the terrestrial and aquatic environments, and how these changes are affecting long term productivity of fish and wildlife species on the Copper River Delta. The work has generated interest and participation from 12 universities around the nation and Mexico.
- Rusty blackbird foraging and habitat distribution project: Rusty blackbirds are one of the most rapidly declining bird species in the U.S. and are being considered for nomination as a candidate species under ESA. One of the most compelling arguments for the decline is the loss of wetlands due to climate change and the resultant change in the invertebrate community. The Forest Service is collecting data on habitat use, foraging, nest density, and nest success for this declining species, which will help determine whether low productivity on declining nesting grounds could be the cause for decreased populations.

Photographic Monitoring. A project was initiated in 2006 to assess landscape changes in the Chugach National Forest through the use of repeat photography (RP). A total of 824 historical photographs dating as far back as 1897 have been examined for the Chugach. The compilation of photographs provide the framework for a photographic monitoring network using RP in the Chugach. Review of photographs after RP in 2006 indicates that a variety of changes associated with biological and geomorphic processes have occurred in the Chugach. Plant succession has been relatively rapid on morainal surfaces and relatively slow on bedrock surfaces exposed by recent glacial retreat. Successional processes associated with coastal uplift and fire also were detected. Most glaciers that were re-photographed in Chugach have retreated over the last century and retreat has been dramatic in some instances.

Forest Inventory and Analysis. Monitoring data are collected on a systematic grid across the Forest and represent a wealth of information for both applied and basic questions concerning forest ecosystems. See: http://fia.fs.fed.us/.

State & Private Forestry's Monitoring of Insect Pests as Bioindicators of Climate Change. A study plot trap line from Prince William Sound in the south to the Brooks Range in the north used to monitor and predict northern shifts in forest insect pest activity. This transect, and our existing field station at Broadview on the Kenai Peninsula, are used by a variety of researchers studying other impacts of climate change.

Restoration Work:

Restoration work on Resurrection, Cooper, and Daves Creeks will improve the resilience and robustness of ecosystems impacted by past mining and road operations. Restored ecosystems will have an increased ability to adapt to climate change. Project information available under "Land & Resources Management" at: www.fs.fed.us/r10/chugach.

Education and Alliances:

The pioneering partnership with Alaska Geographic establishing the Chugach Children's Forest places climate change education front and center as a Forest priority. For more information, please visit: http://www.alaskageographic.org/category/159/childrens-forest.

The Forest is working with the University of Alaska Anchorage to convene a Southcentral Alaska/Chugach Climate Summit during the United Nation's 2011 International Year of the Forest.

More Information

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