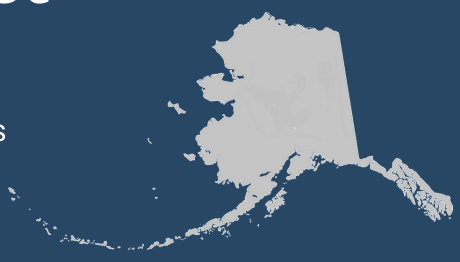
Drought in the Rainforest

A PRIMER FOR SOUTHEAST ALASKA

Southeast Alaska has experienced abnormally dry conditions in recent years, impacting hydroelectric power generation, drinking water, streams, fish, and fish hatcheries.



Southeast Alaska is warming, and precipitation patterns are changing.

Alaska is warming at more than double the rate of the rest of the world. As warming occurs, precipitation patterns are changing as well. In 2018, some towns in the panhandle received less than half their normal winter precipitation. The 2017/2018 drought in southern southeast Alaska was the most significant drought during the wet season in over forty years for this area.

SE AK Climate Outlook: Quick Facts

Based on the average of five climate models, the following trends are projected for southeast Alaska compared to 1970-1999 for the RCP 4.5 (low to mid emissions) and RCP 8.5 (higher emissions) pathways.

	TEMPERATURE	PRECIPITATION
RCP 4.5	about +2 to 5˚F by the 2040s +4 to 6˚F by the 2080s	about +8% to 15% by the 2040s +10% to 20% by the 2080s
RCP 8.5	about +3 to 6˚F by the 2040s +7 to 10˚F by the 2080s	about +9% to 16% by the 2040s +14% to 29% by the 2080s

Temperatures will increase more in the cool season (fall and winter) than in the summer.

Under a lower emissions scenario, temperatures will increase by about half what they are projected to under higher emissions.

Precipitation will increase more in winter and spring.

The region will transition from a snow-dominated ecosystem to a rain-dominated ecosystem, with lessening snowpack and a shorter snow season.

IMPACTS

Petersburg, Wrangell, Ketchikan, and other communities in southeast Alaska rely on diesel-generated power when hydropower reservoirs are low.

Record low water levels impact hatcheries, and could require the transportation of millions of fish. In rivers without glacial input, low rainfall raises temperatures and lowers stream flow and dissolved oxygen rates.

Low summer and winter stream flows can impact salmon spawning by drying out or freezing eggs and altering run times.

Rainwater catchment systems are the primary water source for many households, and low rainfall has forced many to find an alternative supply of water.

Snow drought heightens yellow-cedar mortality by freezing due to lack of insulation.

Southeast Alaska is projected to see more precipitation with climate change, not less. Why are we experiencing drought conditions?

Though the long-term climate projections show significant increases in precipitation in southern Alaska, there are still likely to be periods of low precipitation. Year-to-year climate trends are driven by persistent ocean-atmosphere patterns like the Pacific Decadal Oscillation and the Blob. The shifting patterns are not well captured by climate models, and are the largest source of uncertainty for projections of the early 21st century.

This natural climate variability and the lack of fine-scale climate models for southeast Alaska make it difficult to model short term trends. Higher resolution climate data through **downscaling** will improve our understanding of current drought patterns.

Additionally, southern southeast Alaska has a summer projection more similar to the Pacific Northwest than the rest of Alaska. That is, we could see a long term increase in annual precipitation driven by wetter cool season trends, while also seeing a decrease in summer precipitation and a decrease in warm season available water as snowpack levels change.

Based on published literature from AK CASC scientist Jeremy Littell. For more information, contact jlittell@usgs.gov.

What is the US Drought Monitor?

The US Drought Monitor is a national index of drought conditions, released via a weekly map showing parts of the U.S. that are in drought. It is jointly produced by the National Drought Mitigation Center (NDMC), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Department of Agriculture (USDA). They use a number of methods to determine drought levels, including comparing observed precipitation, soil moisture, and crop conditions with what's normal, or by looking at how much water is contained in snow, the level or flow rate of moving water, water in reservoirs, or groundwater levels.

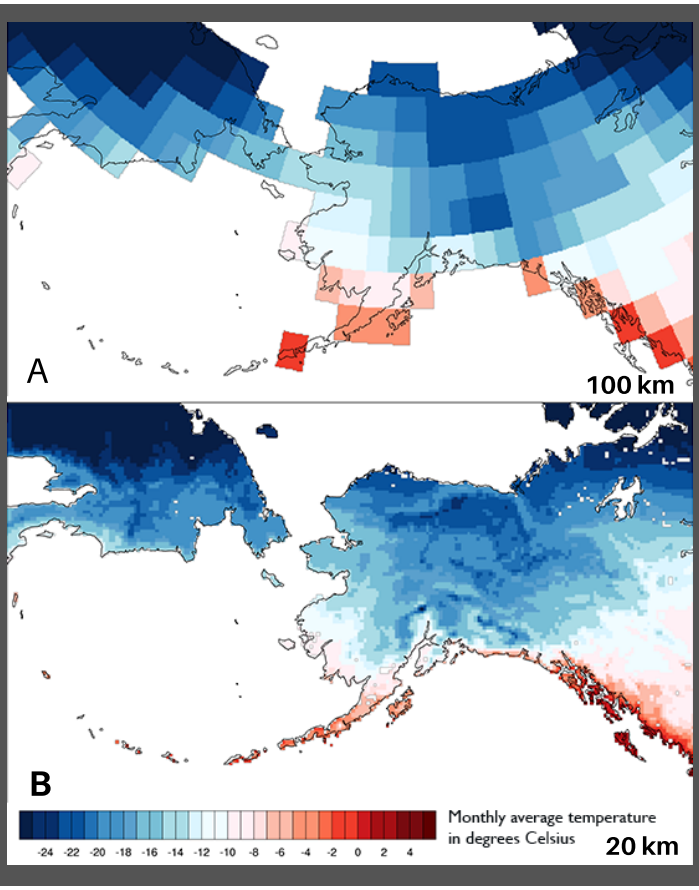
Contribute via the Drought Reporter

Visit: https://droughtreporter.unl.edu

What is downscaling?

The Alaska Climate Adaptation Science Center and Scenarios Network for Alaska + Arctic Planning create high-resolution climate models through a process known as downscaling. Downscaling takes coarse, global scale climate models (A) and uses historical climate observations to refine them to a local scale (B). A single grid cell of a global climate model can span 100 kilometers (nearly the size of Baranof Island), which can be ineffective for local-scale planning efforts and decision making. In Alaska, the high spatial variety of the landscape and large variations in temperature and precipitation make high resolution climate projections necessary, but there are also limitations. There are less weather stations and historical climate records, which increases the uncertainty in the models.

The AK CASC is creating a 4-kilometer resolution climate model for southeast Alaska. To learn more about these efforts, visit casc.alaska.edu.



USDA Northwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE
NDMC NATIONAL DROUGHT MITIGATION CENTER
AK CASC Alaska Climate Adaptation Science Center