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.

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 (see reverse for detail), there are still likely to be periods of low precipitation. Inter-annual climate trends are driven by persistent ocean-atmosphere interactions, and historical climate data shows that 30-year climate averages are affected by these variations. Natural climate variability is the largest source of uncertainty between now and the mid-21st century. Additionally, uncertainty in precipitation models for southeast Alaska is higher than in temperature models.

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.

IMPACTS

Petersburg, Wrangell and Ketchikan relied on diesel-generated power in the winter of 2017/2018 due to lack of available hydropower.

Hatcheries saw record low water levels, and considered transporting millions of fish. In rivers without glacial input, low rainfall raises temperatures, and lowers stream flow and dissolved oxygen rates.

Rainwater catchment systems are the primary source of water for many households.

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

What is the US Drought Monitor?

The US Drought Monitor is a national index of drought conditions, release 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

USDA Northwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

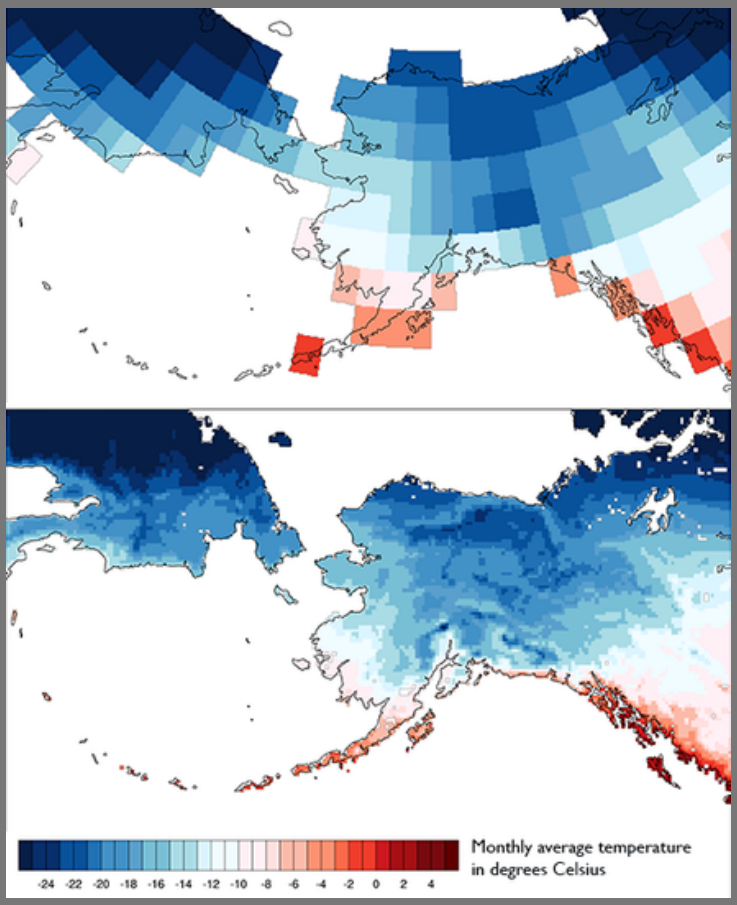
NDMC NATIONAL DROUGHT MITIGATION CENTER

AK CASC
Alaska Climate Adaptation Science Center

What is downscaling?

The AK CASC 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 and uses historical climate observations to refine them to a local scale. 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 precipation 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.

Current AK CASC work is creating 4-kilometer and 1-kilometer resolution precipitation models for watersheds in Southeast Alaska. To learn more about these efforts, visit casc.alaska.edu.



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	~2 to 5˚F by the 2040s ~4 to 6˚F by the 2080s	~8% to 15% by the 2040s ~10% to 20% by the 2080s
RCP 8.5	~3 to 6˚F by the 2040s ~7 to 10˚F by the 2080s	~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.

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