



Climate in Lake Clark

Weather and climate are key physical drivers of ecosystem structure and function. Because global climate models indicate that climate change and variability will be greatest at high latitudes, climate monitoring is critical to understanding the changing conditions of park ecosystems. Some potential effects in Southwest Alaska parklands include a reduced snowpack, earlier lake-ice breakup, warmer winters, and wetter summers. These changes will likely affect the distribution, abundance, growth, and productivity of plants and animals.

Lake Clark National Park and Preserve, located in Southcentral Alaska, straddles three climate divisions, Bristol Bay, Cook Inlet, and the Central Interior. It is divided southwest to northeast by the Alaska and Aleutian mountain ranges (Bieniak et al. 2015). The Bering Sea and the Pacific Ocean significantly influence the climate of this region by moderating the transfer of energy and water vapor to and from the atmosphere resulting in a maritime influenced climate on the south and west sides of the park. To the northwest of the Chigmit Mountains the climate patterns are more typical of Alaska's western interior that is often colder in the winter and warmer in the summer.

We operate weather stations in each of Lake Clark's three climate divisions where the patterns of annual temperatures show differences due to their association with climate divisions and altitude. The snowy, high-altitude station of Chigmit Mountain straddles the crest of the range where it is cold most of the year (Figure 1). In contrast, the Silver Salmon Lakes station on the Cook Inlet coast has moderate temperatures year-around and the Port Alsworth station shows a similar pattern that is sometimes influenced by the seasonal ice cover on Lake Clark and the Bristol Bay. Finally the Stony station shows the broadest range of temperatures due to its location in the Western Interior climate division (Figure 2).



Figure 1. Looking east toward Mount Redoubt, the Chigmit Mountain station (foreground) straddles the crest between the maritime and interior climates of Lake Clark National Park and Preserve and is surrounded by snow and ice.

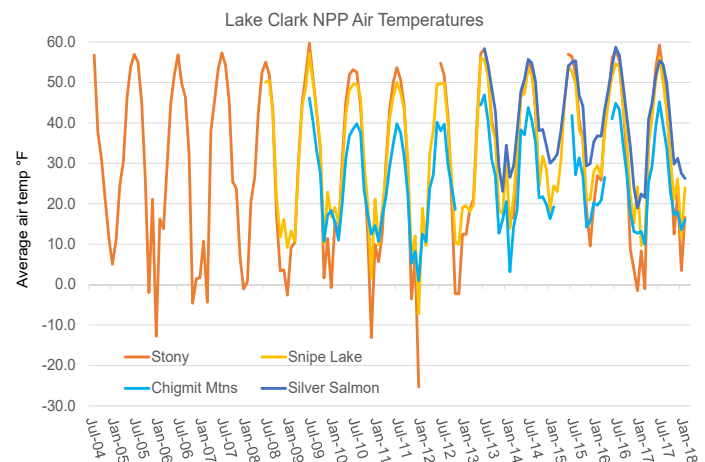


Figure 2. Differences in monthly mean annual temperatures at Lake Clark's weather stations are most influenced by their distance from the ocean, topography, and altitude.



Patterns in sea surface temperatures and other climate dynamics will affect Southwest Alaska's weather this spring and summer. Typically, the northern seas that surround Alaska (the Bering, Chukchi, and Beaufort) are mostly ice-covered in winter (Figure 3). However, this year saw the lowest ice cover since satellite observations began in 1979. The Bering Sea, which is much warmer than normal, has had areas of open water that are historically unprecedented. So far this year, the Northern Pacific is only slightly warmer than normal, with a

positive *Pacific Decadal Oscillation*, a long-term index of sea surface temperature (Namias 1959, Mantua and Hare 2002). Due to these and other climate influences, Southwest Alaska's 2018 temperatures are predicted to be above normal this spring and summer. Precipitation is more difficult to predict and thus, predictions have higher uncertainty. Regional forecasts range from weeks to several months and are regularly updated from multiple models they can be found at: cpc.ncep.noaa.gov/products/predictions.

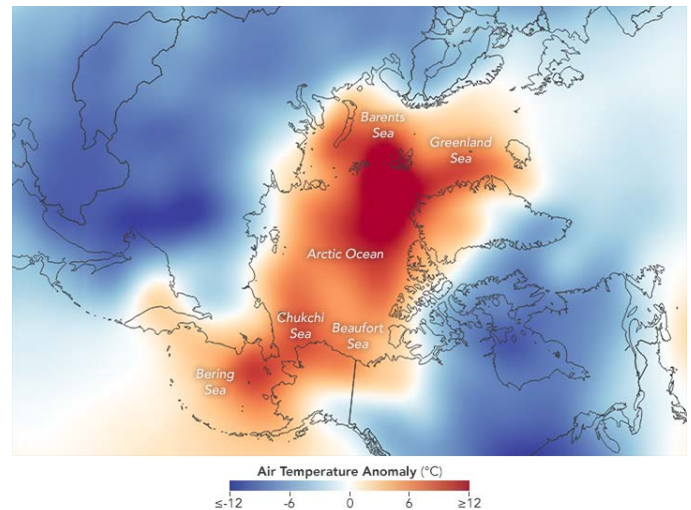
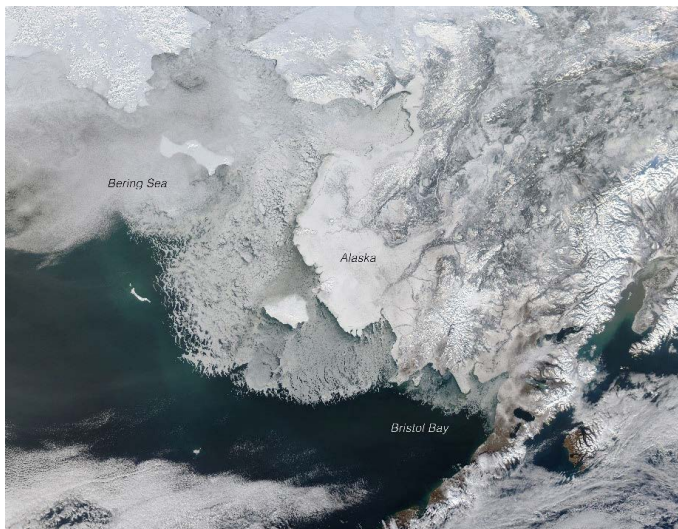


Figure 3. Ice covers much of the Bering Sea into Bristol Bay throughout the winter and spring in normal years (April 2015; above, left). Ice cover in 2018 has been the lowest since observations began in 1979 due to warmer-than-normal air temperatures over the Arctic (February 2018; above, right). The warmer sea surface temperatures are expected to affect Southwest Alaska's climate throughout the spring. Image sources: Johnson Space Center and NASA Earth Observatory.

References

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