



Climate in Katmai

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.

Katmai National Park and Preserve and Aniakchak National Monument and Preserve are geographically located between the Bering Sea and the Pacific Ocean, both seas influence the climate of the region by moderating the transfer of energy and water vapor to and from the atmosphere. Climatically, these transfers of energy are characterized by persistent seasonal to multi-decadal patterns. Specifically, seasonal sea ice in the Bering Sea and the distribution of warm or cool water in the central northern Pacific and coastal areas along the Gulf of Alaska contribute to the seasonal and long-term climate of Southwest Alaska.

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 1). However, 2018 saw the lowest ice cover since satellite observations began in 1979 and the Bering Sea, which is much warmer than normal, has had historically unprecedented areas of open water. 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

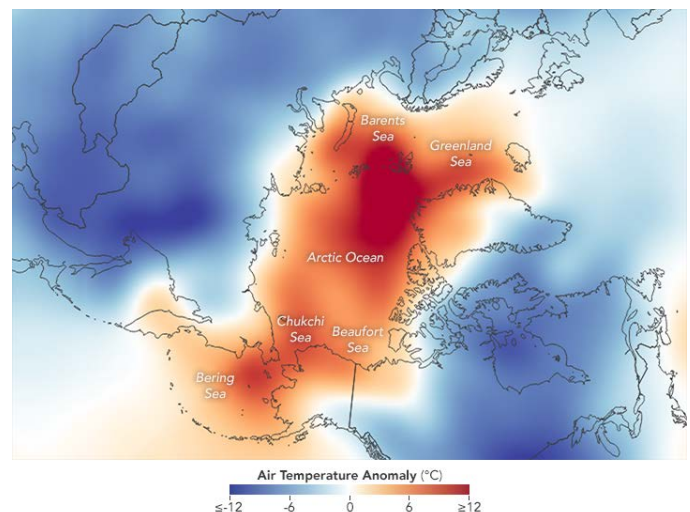
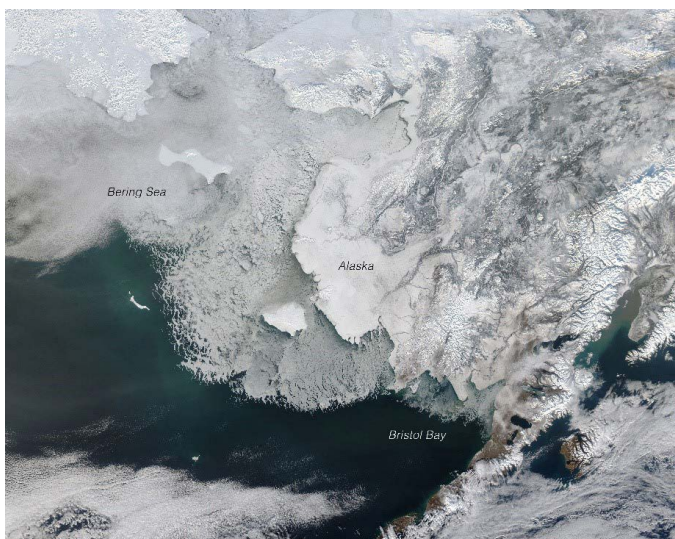


Figure 1. Ice covers much of the Bering Sea into Bristol Bay throughout the winter and spring in normal years (April 2015; above, left). Ice cover in 2018 has been the lowest since observations began in 1979 due to warmer-than-normal air temperatures over the Arctic (February 2018; above, right). The warmer sea surface temperatures are expected to affect Southwest Alaska's climate throughout the spring. Image sources: Johnson Space Center and NASA Earth Observatory.



and other climate influences, Southwest Alaska's 2018 temperatures are predicted to be above normal this spring and summer. Although precipitation trends are much harder to predict, a slight increase is expected (cpc.ncep.noaa.gov/products/predictions).

Local King Salmon weather has been continuously observed for 70 years, one of the longest records in Southwest Alaska with intermittent measurements from as early as 1919. Temperatures for the years of 2015 and 2016, based on water years (October-September), were

the hottest in the King Salmon temperature record, with the years of 2003 and 2014 ranking third and fourth (Figure 2). This record also shows a slight increase in annual precipitation, where 2014 and 2016, in spite of being among the years with greatest precipitation, have some of the lowest snow depths (Figure 3). These patterns are consistent with what we expect in a warming climate where higher sea surface temperatures contribute to higher air temperatures and greater precipitation in some locations.

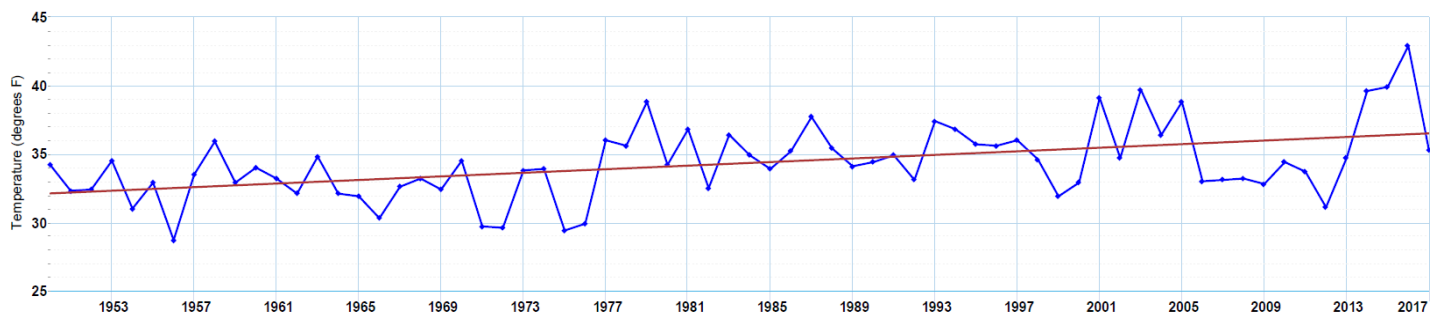


Figure 2. Temperature data from King Salmon, Alaska showing a warming trend and the warmest year in 2016.

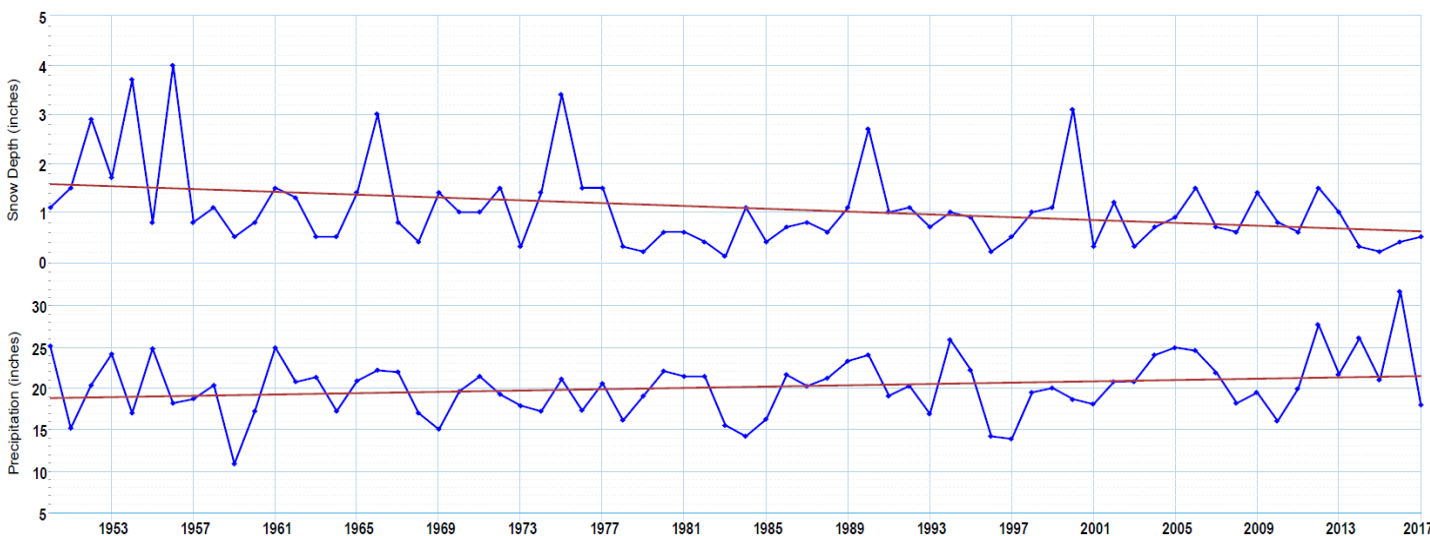


Figure 3. The relationship between snow depth and precipitation in King Salmon, Alaska, show that although there was high precipitation in 2014 and 2016, snow depth remained low.

References

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