Climate Change and Dog Sledding in Denali

A Data Analysis Lesson Plan

Featuring weather data collected by Pam Sousanes, Physical Scientist, National Park Service

Background

Sled dogs have been important to people living in northern climates for thousands of years. This tradition of working with dogs to move people and freight across the land is called mushing. Mushing skills and experiences have been passed down through generations. Although many people living in the North use snowmobiles to get around, mushing remains an essential way of life in Denali National Park and other northern communities.

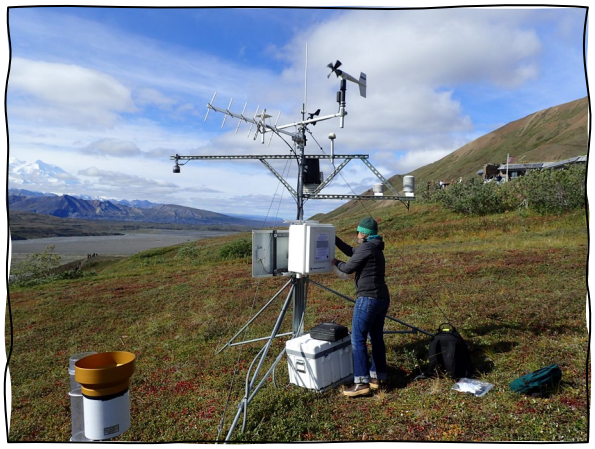
Park rangers in Denali have been working with sled dogs since 1922. Historically, the dogs helped rangers to patrol park boundaries and prevent poaching. Today, park rangers and scientists depend on Denali's sled dogs for moving supplies and scientific equipment deep into the park where motorized vehicles are not permitted. The dogs also help rangers monitor the condition of the park and create trails in the snow for other visitors to use. Using dogs and sleds helps to keep Denali's history and traditions alive.

Sled dogs on patrol.
NPS Photo / T. Devine

Snow is a key ingredient for mushing. Denali's subarctic climate, where snow generally covers the ground for more than six months of the year, is perfect for mushing. However, climate change is impacting the timing of the snow season in the fall and spring and the condition of the snow in mid-winter.

Scientists are looking at weather and climate patterns to help understand these changes over time. *Weather* is what we experience on a day to day basis, while *climate* is the average of the weather conditions over time. Denali scientists can study the climate of Denali because of a long record of weather observations at Denali Park headquarters. For more than 70 years, park staff have recorded the air temperature, rainfall and snowfall amounts, and snow depth every

single day! This valuable data, along with data from other climate stations around the park, provides the information needed to look at changes over time.



Climate scientist Pam Sousanes working on the Eielson Visitor Center climate station in Denali National Park and Preserve. NPS Photo.

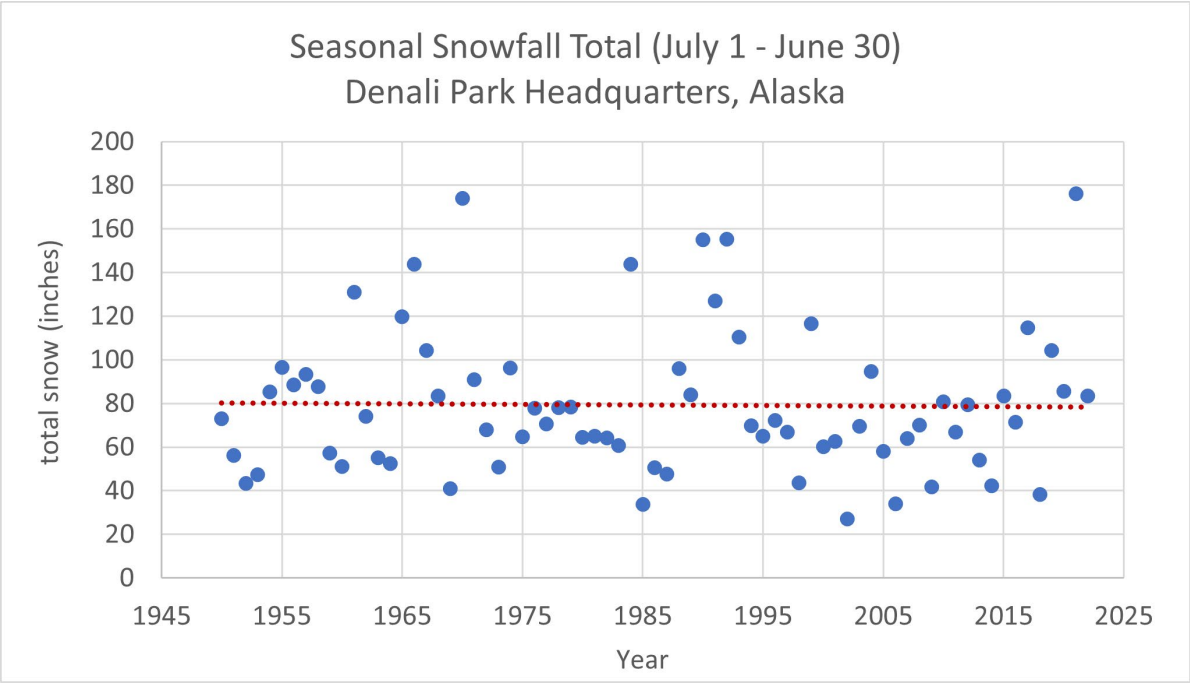
Since 1950, temperatures in Denali have warmed, summer rainfall has increased, and winter snowfall has decreased. The yearly temperatures at Denali Park have warmed by 3°F. That might not sound like a lot, but in northern climates, even small temperature changes can mean the difference between rain or snow. Warmer temperatures in the spring and fall can result in a late start or early end to the mushing season.

Extreme weather events associated with a warming climate also impact mushing. For example, if temperatures are above freezing in the winter, it may rain on top of the snow. This can form a hard crust and create difficult and dangerous travel conditions for the dogs and people.

The timing and amount of snow, combined with extreme weather events, are climate changes that can impact the mushing tradition in Denali. What do you think might happen to Denali's snow if the climate continues to warm? How do you think this might impact the ability of park staff to practice mushing?

Scientific Data and Analysis

Graph A:



What information is being shown on the X-axis (horizontal)?_____

What information is being shown on the Y-axis (vertical)? _____

What does each dot mean? _____

What was the snowfall total in 2015? _____

Which year had the highest snowfall? _____

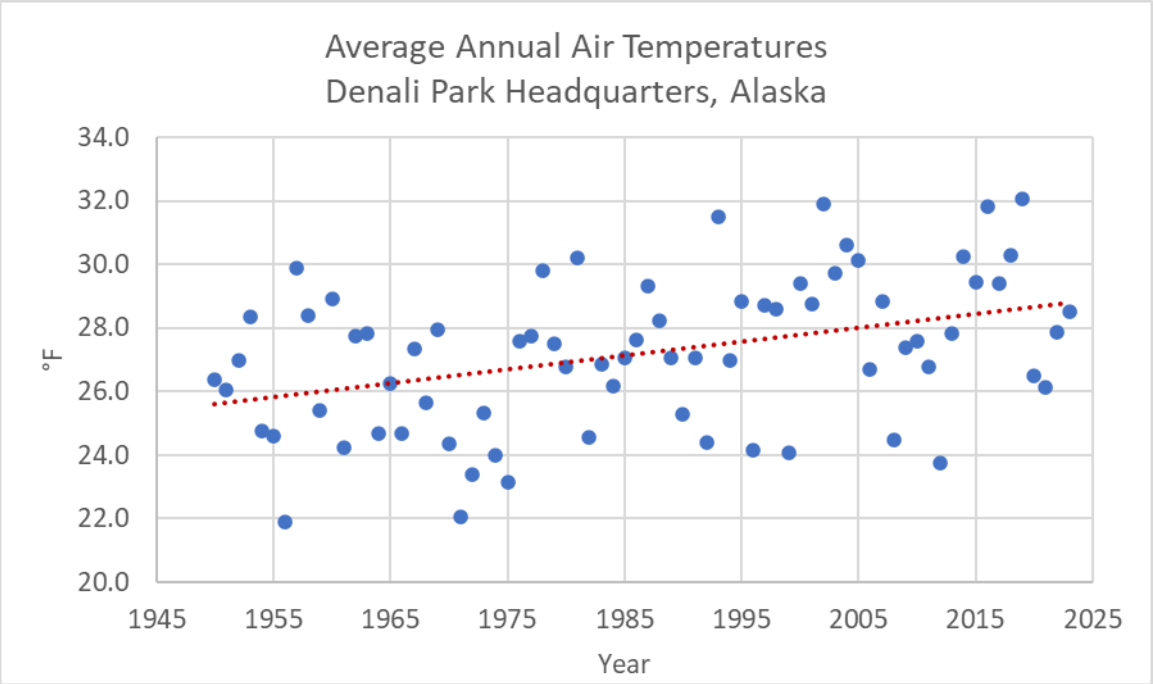
What do you notice about the *trend* of the data in the graph? (hint: What do you notice about the red line?) _____

Make a claim about what this graph tells you.

_____

_____

Graph B:



What information is shown on the X-axis (horizontal)? _____

What information is shown on the Y-axis (vertical)? _____

What does each dot mean? _____

What was the average temperature in 2015? _____

Which year had the lowest average temperature? _____

What do you notice about the *trend* of the data in the graph? (hint: What do you notice about the red line?) _____

Make a claim about what this graph tells you.

_____

_____

Connect the data to what you have learned

What does Graph A tell you about the amount of snow falling in Denali?

_____

How does this connect to a changing climate?

_____

What does Graph B tell you about the temperature in Denali?

_____

How does this connect to a changing climate?

_____

If the trend in Graph B continues, how might this affect future snow seasons?

_____

How might sled dog traditions in Denali be affected if these trends continue? (hint: if the temperature continues to rise, do you think snowfall amounts might get lower, higher, or stay the same?) _____

How can Denali managers continue to preserve sled dog traditions in a changing climate?

_____

_____

Think of a tradition practiced by your family or community that might be impacted as the climate gets warmer – how might it be impacted over time?

_____

_____

How might you help to preserve your tradition as the climate changes?

_____

Your next steps as a scientist

Science is an ongoing process. Imagine you are a scientist in Denali. What new question(s) should be investigated? They can relate to sled dogs, Alaskan tradition, or a changing climate.

How do your questions build on the research that has already been done?

What future data should be collected to answer your question?

What will you be measuring?:

How will you measure this?:

What hypothesis are you testing in your experiment? A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

How might the data that you collect help managers to prepare for the future?