Final Report- Analyzing the Effects of mountains show depth on air temperature.

Description

Climate change is one of the most pressing issues of our time, with far-reaching impacts on various environmental factors. This report investigates the impact of climate change on air temperature and snow depth using historical data. The primary objective is to understand trends and anomalies in these parameters over time and assess the potential implications of these changes.

Data Source

Air Temperature Data

- Data Source : Western juniper-dominated Experimental Catchments in south western Idaho, USA
- Metadata URL : https://data.gov/
- Data URL : https://ndownloader.figshare.com/files/44334659
- Content : Air temperature data of six places at south wester Idaho, USA in celsius, water_year, month, day calendar_year from 2007-2013.

Raw Data

	water_year	month	day	calendar_year	hour	sme2_ta_C	smf1_ta_C	smg1_ta_C	smg2_ta_C	smm1_ta_C	smm2_ta_C
1	2008	10	01	2007	00	9.0	9.4	9.7	9.2	8.8	8.7
2	2008	10	01	2007	01	8.1	8.7	9.0	8.4	8.6	8.1
3	2008	10	01	2007	02	7.2	8.4	8.8	8.0	8.4	7.6
4	2008	10	01	2007	03	6.6	7.8	8.3	7.5	7.8	7.1
5	2008	10	01	2007	04	6.2	7.7	7.9	7.1	7.5	6.7

Snow Depth Data

- Data Source : Western juniper-dominated Experimental Catchments in south western Idaho, USA
- Metadata URL : https://data.gov/
- Data URL : https://ndownloader.figshare.com/files/44334722
- Content : Snow depth data of six places at south wester Idaho, USA in millimeter, water_year, month, day calendar_year from 2007-2013.

Raw Data

	water_year	month	day	calendar_year	hour	sme2_sd_mm	smf1_sd_mm	smg1_sd_mm	smg2_sd_mm	smm1_sd_mm	smm2_sd_mm
1	2008	10	01	2007	00	0	0	0	0	0	0
2	2008	10	01	2007	01	0	0	0	0	0	0
3	2008	10	01	2007	02	0	0	0	0	0	0
4	2008	10	01	2007	03	0	0	0	0	0	0
5	2008	10	01	2007	04	0	0	0	0	0	0

Data Structure, Quality and Source Licenses

These datasets are collected from authentic sources. Which is reflect the real world data and accurate. All dataset information is complete and very few missing values. All data are received from US government open sources and available for public use. The licence is us-pd and has no copyright restrictions.

Analysis

Methodology

The analysis involved the following steps:

1. Data Extraction: Extracting the relevant data from the SQLite database.
2. Date Table Creation: Two comprehensive date tables are generated to ensure consistency in date-related data across both datasets. This function, create_date_table, creates a DataFrame with a range of dates, including various components like

year, month, day, and quarter.

3. Clean Data: Clean the data and Removes the unnecessary columns from the datasets, like water_year. Marge month, day, calendar_year colunm into a single column name date. it also reanames some columns for efficient use during analysis.
4. Data Type Conversions: The script includes conversions of data types, ensuring that each column in the datasets is of the appropriate data type for analysis. For instance, converting strings to dates.
5. Trend Analysis: Analyzing trends in air temperature and snow depth over time.
6. Correlation Analysis: Assessing the correlation between air temperature and snow depth.

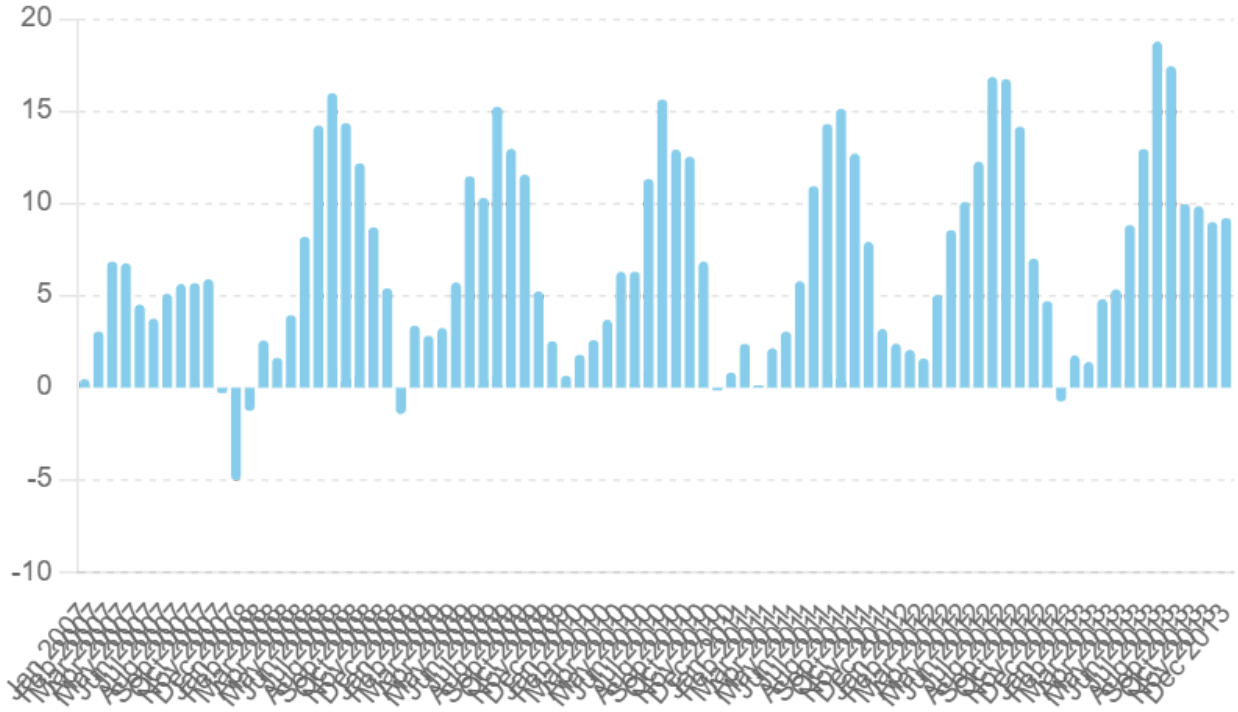
Clean Data of Air Temperature

	date *TEXT*	hour *INTEGER*	sme2 temperature in celsius *REAL*	smf1 temperature in celsius *REAL*	smg1 temperature in celsius *REAL*	smg2 temperature in celsius *REAL*	smm1 temperature in celsius *REAL*	smm2 temperature in celsius *REAL*
1	10-01-2007	0	9.0	9.4	9.7	9.2	8.8	8.7
2	10-01-2007	1	8.1	8.7	9.0	8.4	8.6	8.1
3	10-01-2007	2	7.2	8.4	8.8	8.0	8.4	7.6
4	10-01-2007	3	6.6	7.8	8.3	7.5	7.8	7.1
5	10-01-2007	4	6.2	7.7	7.9	7.1	7.5	6.7

Clean Data of Snow Depth

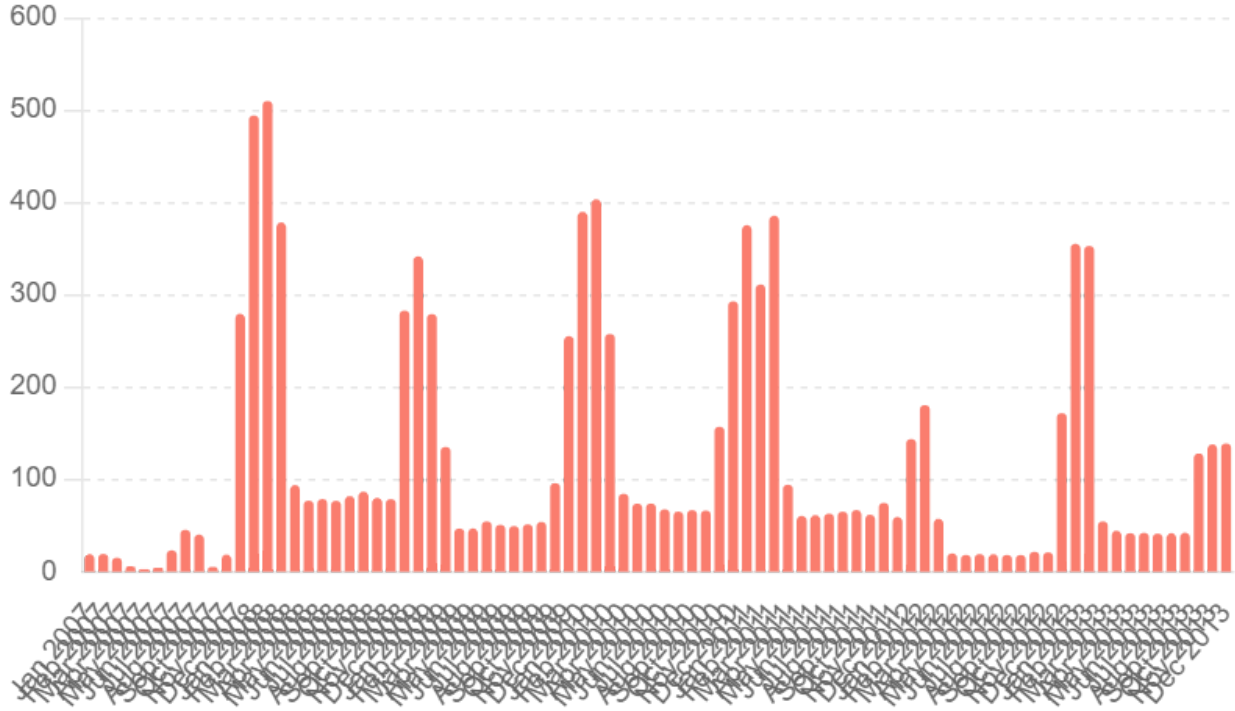
	date *TEXT*	hour *INTEGER*	sme2 snow depth in millimeters *INTEGER*	smf1 snow depth in millimeters *INTEGER*	smg1 snow depth in millimeters *INTEGER*	smg2 snow depth in millimeters *INTEGER*	smm1 snow depth in millimeters *INTEGER*	smm2 snow depth in millimeters *INTEGER*
1	10-01-2007	0	0	0	0	0	0	0
2	10-01-2007	1	0	0	0	0	0	0
3	10-01-2007	2	0	0	0	0	0	0
4	10-01-2007	3	0	0	0	0	0	0
5	10-01-2007	4	0	0	0	0	0	0

Average Monthly Air Temperature

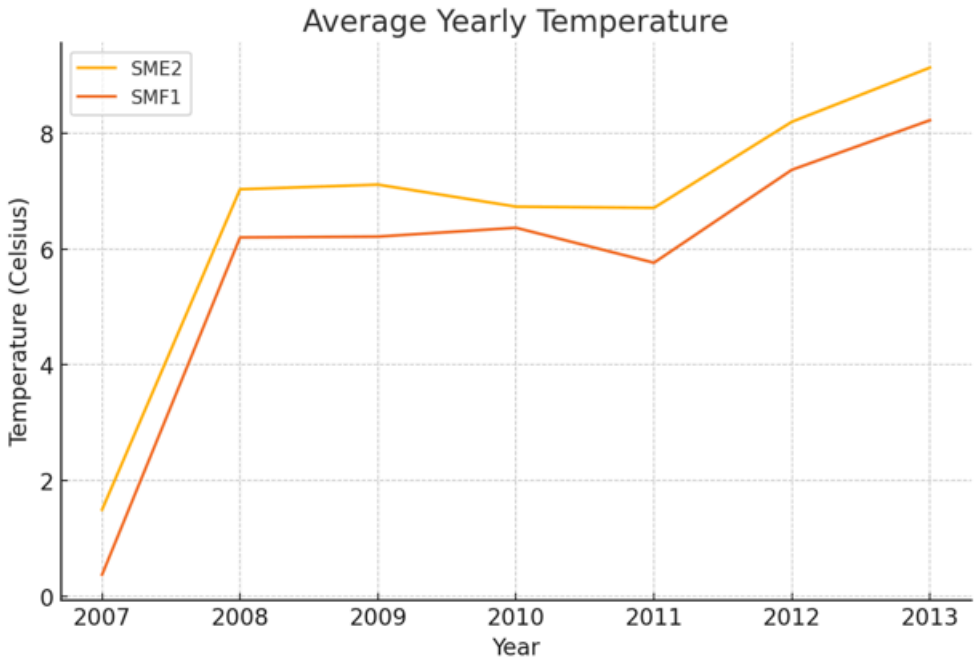


The graph of average monthly temperatures shows a clear seasonal pattern of all months from 2007 to 2013. Each year shows significant peaks during the summer months. Comparing these peaks can indicate if there is a general increase or decrease in summer temperatures over the years.

Average Monthly Snow Depth

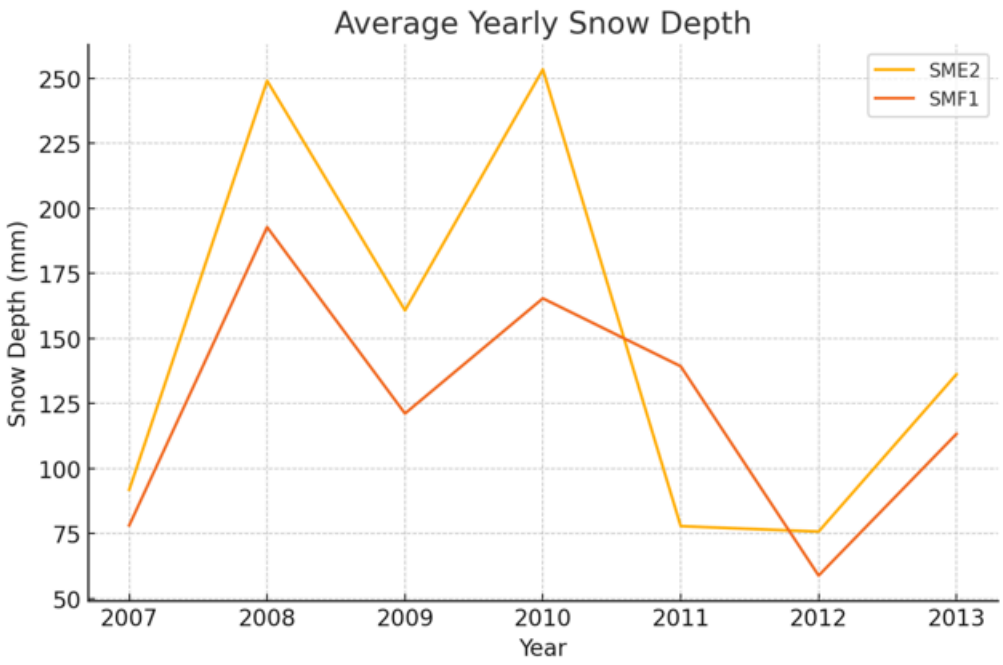


The average monthly snow depth graph shows a complementary pattern form 2007 to 2013. The graph showes that snow depth decrease during the summer months of every years.

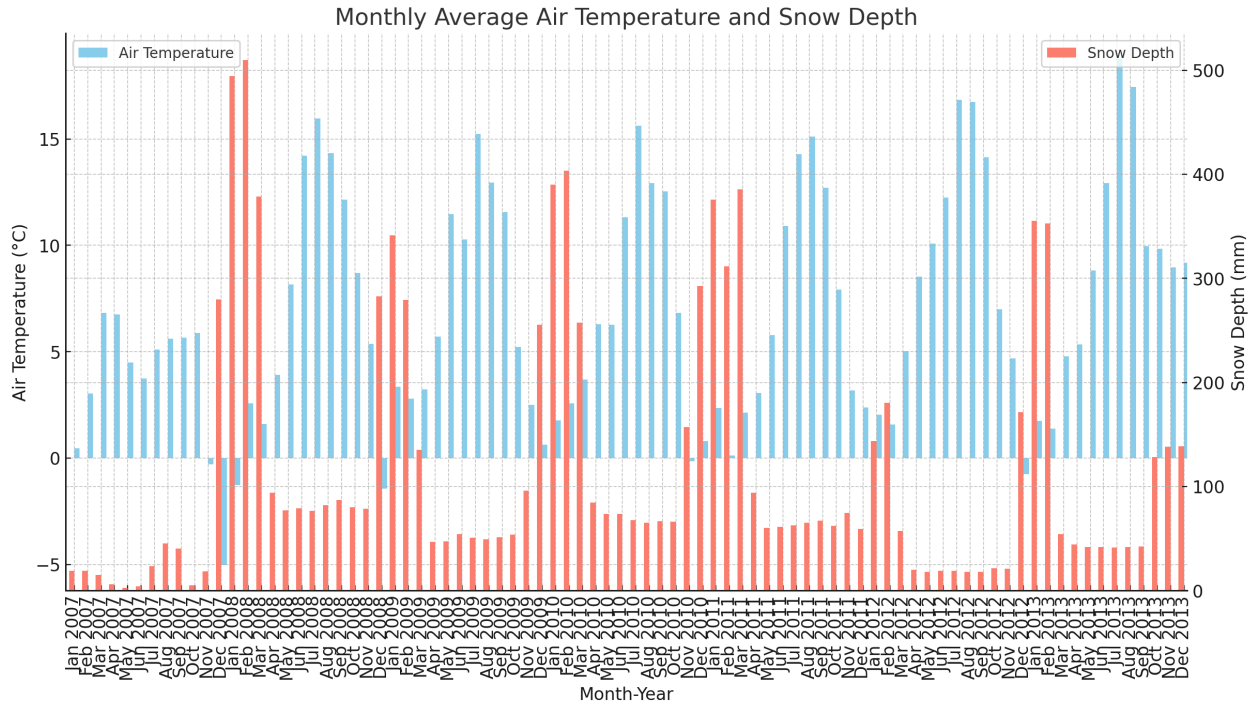


This graph shows the average yearly temperature from two location (SME2 and SMF1). Over the years, a gradual increase in the average temperature can be observed, suggesting a warming trend. This could be indicative of long-term climate change.

And the bottom graph presents the average yearly snow depth recorded by the two location (SME2 and SMF1). Unlike temperature, the snow depth does not show a clear long-term trend. The variability year-to-year suggests that snow depth is influenced by more immediate and possibly random weather patterns rather than long-term climate trends.



Correlation between air temperature and snow depth



Result

1. This inverse relationship is consistent with climate science, where warmer temperatures lead to snowmelt and reduced snow accumulation.
2. Warmer temperatures cause more rapid snowmelt, exposing bare ground.
3. Rising air temperatures lead to shifts in ecosystems and landscapes. Glaciers recede, permafrost thaws, and plant zones migrate, altering the face of our planet.

Conclution

By comparing the monthly and yearly trends of air temperature and snow depth, we can gain insights into the impact of climate change on these environmental factors. The seasonal patterns align with expected behavior, while long-term trends may indicate significant shifts due to climate change.