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ARE YOUR GARDEN PERENIALS BLOOMING EARLIER EACH YEAR?

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REFERENCES

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BACKGROUND

Our research question is asking whether spring flowers are starting to bloom earlier in the year, and how this change is associated with climate change. Global warming is defined not just by increased temperatures, but drastic shifts in weather patterns (IPCC, 2017). Our research will investigate Vermont's weather patterns of temperature and precipitation to see if increased temperatures are causing flowers to bloom earlier in the spring season. Low temperatures with higher precipitation levels right after a thaw that resulted in blooming would have negative impacts on flowers and their ability to thrive after the next thaw (Beaubien & Hamann, 2018).



Figure 2. We will use a greenhouse to store the plants and manipulate the temperatures and precipitations they will endure (Dreamstime.com, Sabelskaya)

MOTIVATION

Climate change is a crisis our world is facing that will have drastic effects on plant species in terms of plant resilience, growing time for agriculture, and plant survival and adaptation (Gade & Payne, 2018). This experiment can help agricultural workers and others in the horticulture field to help determine necessary changes they may have to make to their production due to the drastic changes resulting from climate change. It will even help at-home gardeners and plant lovers alike to understand what is going on in their local environments.

HYPOTHESIS

Our hypothesis is that there is a relationship between climate change and the timing that flowers bloom in the spring (Figure 1).

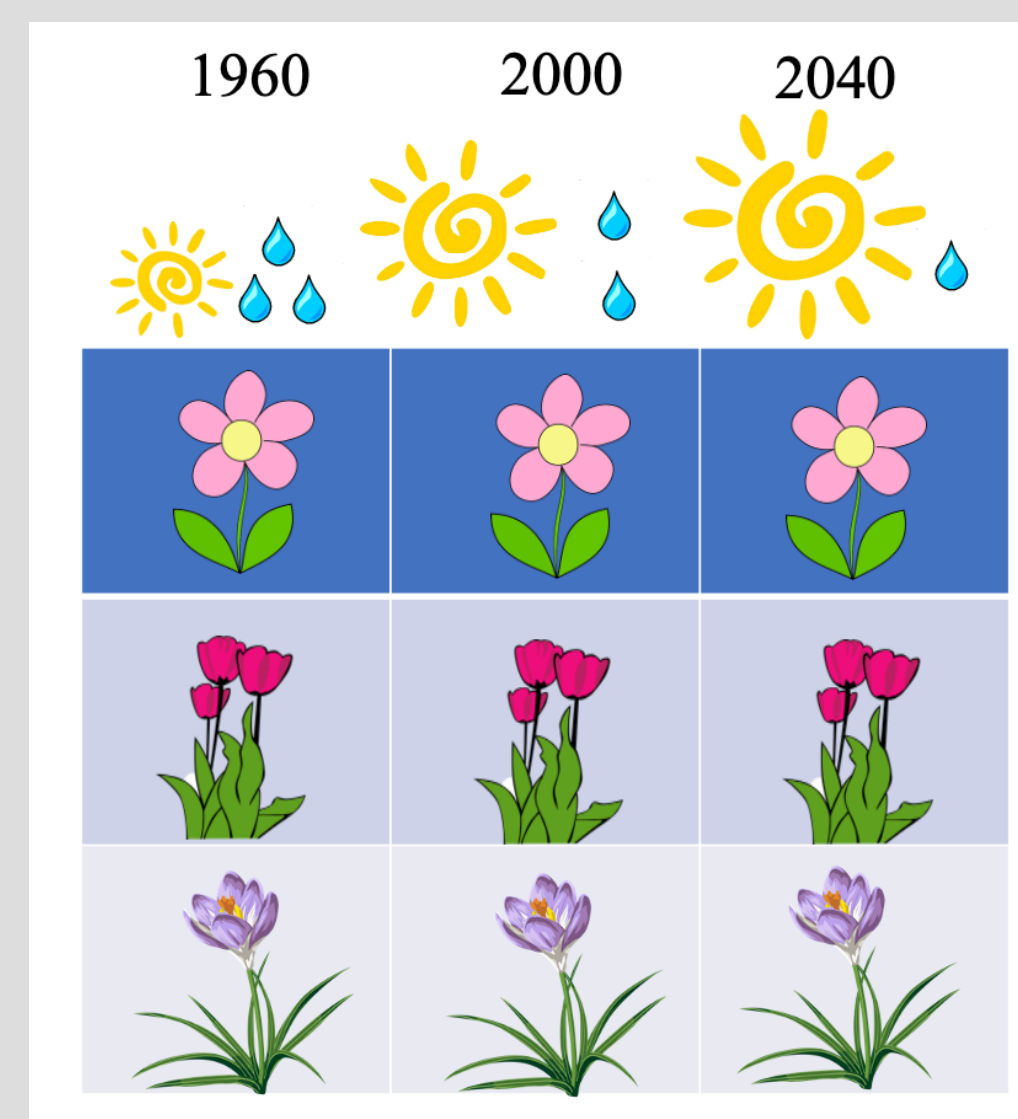


Figure 1. The diagram visually demonstrates the nine different plots and what conditions they will face over the variety time periods. (PowerPoint, Menice)

PREDICTIONS

Our prediction is that as climate change more drastically affects weather patterns, the abnormal changes in temperature and precipitation in the year causes the flowers to bloom earlier. According to a research article from the John Innes Center, scientists found that flowers bloom in a warmer climate because there is an ideal temperature for flowers to bloom at. As the climate increases, changing their ideal temperature for blooming to earlier in the year. We used this article as well as the data provided by the Vermont Data Grapher that shows a steady increase in temperatures for the spring season from 1960, 200, and their predicted ones in 2040 (Health and Science, 2015). This provides evidence for our prediction that as climate change increases our temperatures, flowers will start to bloom earlier in the year.

STUDY DESIGN

Experimental design: The study will use a manipulative lab experiment using a green house, (Figure 2), to simulate temperatures and precipitations from Vermont Climate Data Grapher to pull accurate data to recreate temperatures and precipitations from previous and future years to accurately model how climate change has affected blooming times in the spring (Figure 3&4). We will have three groups, all groups containing the three kinds of flowers. One group will receive the treatment of temperatures and precipitations from the year 1960, one from 2000, and a predicted temperatures from the Vermont Climate Data for 2040.

ANALYSIS

Since our independent variables consist of two groups (precipitation and temperature), which are both continuous, and our dependent variable (time when flowers bloom) is also continuous we would use a regression test.

The regression test will aid us in distinguishing if there is a correlation between when flower species bloom and what the temperature and precipitation is. If the p-value we would calculate is smaller than 0.05, that would show there is statistically significant evidence to reject the null hypothesis and accept the alternative hypothesis that there is a correlation between increased temperature and precipitation and earlier blooming times in flowers.

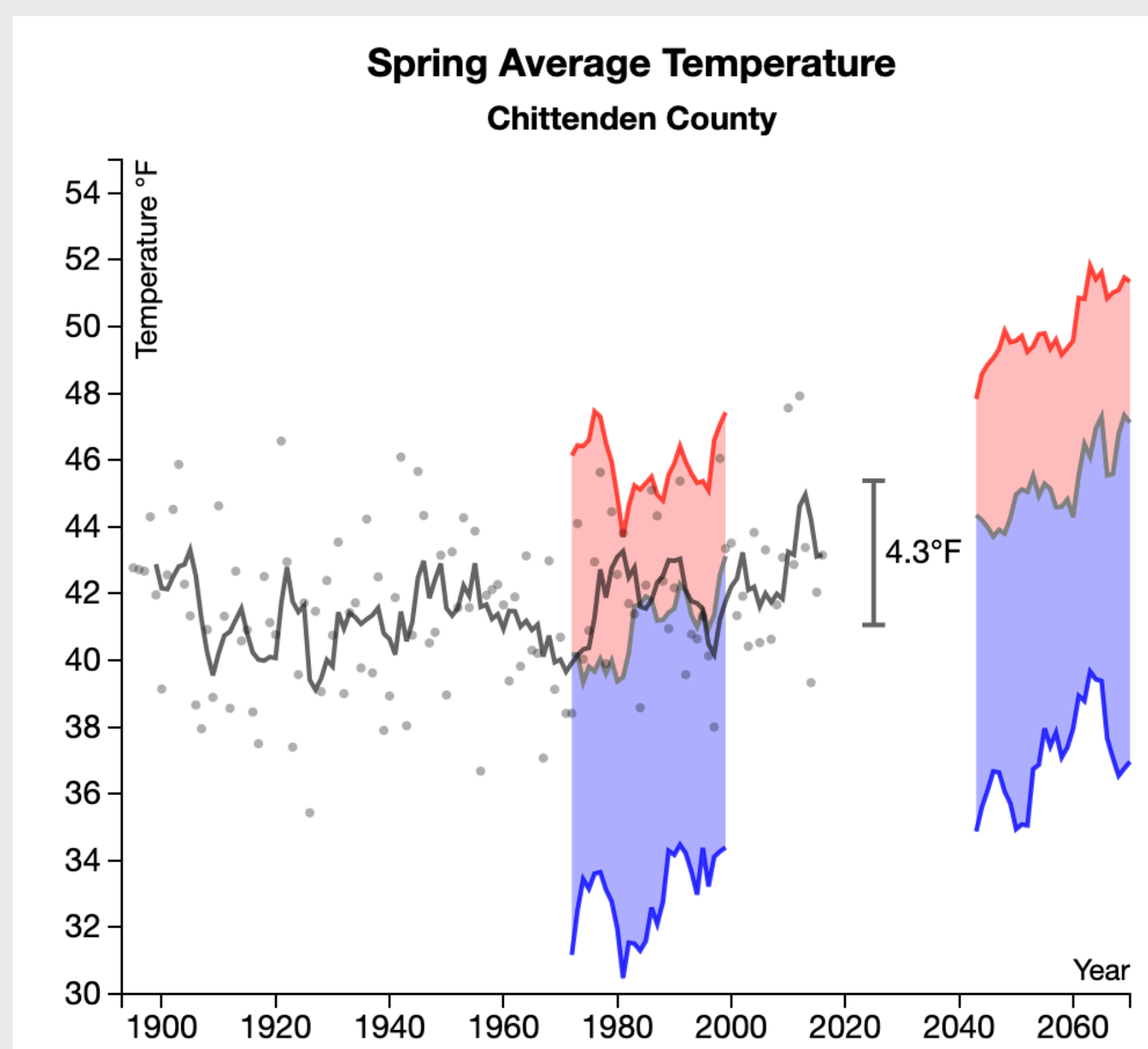


Figure 3. The Vermont Climate Data Grapher plot of the Spring's average temperatures in Chittenden County shows that there is a steady increase in temperatures over time. In 1960 there was an average of 40°F, in 2000 it was 42°F, and in 2040 the projection is 44 °F.

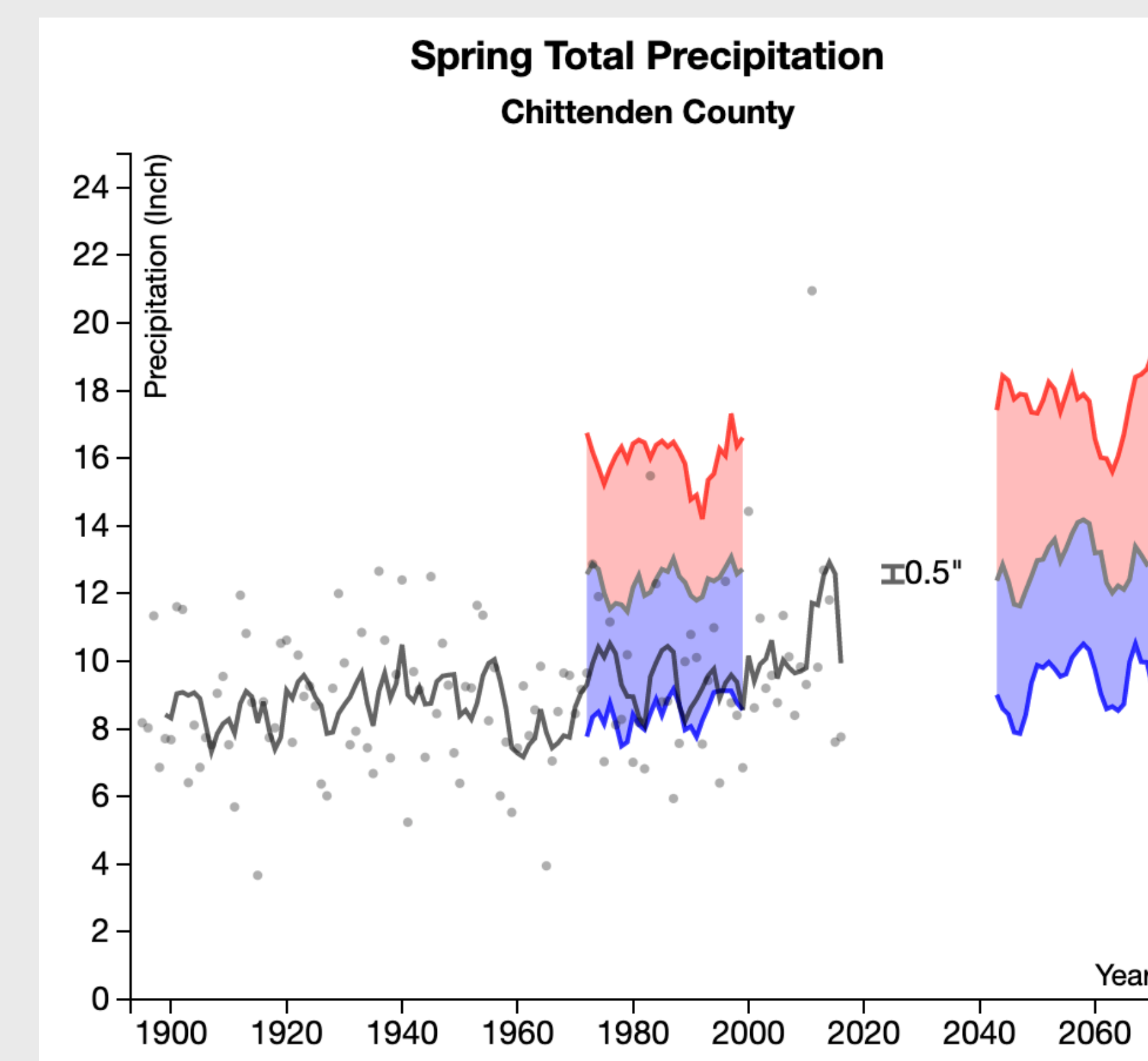


Figure 4. The Vermont Climate Data Grapher plot of the Spring's average precipitation in Chittenden County shows that there is a steady increase in precipitation over time. In 1960 there was an average of 7", in 2000 it was 9", and in 2040 the projection is 12".