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GEOS 305

Low precipitation and the number of acres burned of ponderosa pine & mixed conifer forests of central Idaho

ABSTRACT

Wildfire activity in the Western United States is generally thought to have increased in the past few decades. These wildfires impact local ecosystems and drastically change the landscape. This study compiled data on the annual precipitation at two SNOTEL sites, Banner Summit and Mores Creek Summit and compared it to data collected by the U.S. Forest Service of acres burned by wildfires in Idaho. Results indicate that that acres burned by wildfires in Idaho have increased from 2002-2016 and that annual precipitation during that same span has decreased. These increases and decreases are associated with the El Nino Southern Oscillation and previous land-uses of the region.

INTRODUCTION

In the Western United States, wildfire activity has increased over the past few decades (Westerling, 2006). The increasing wildfires have cost federal agencies increasing sums of money that now top $1 billion per year (Whitlock, 2004). Along with the cost, wildfires are damaging ecosystems, displacing animals and adding carbon emissions to the atmosphere.

Variations in the winter and spring weather in the PNW have been linked to the El Nino Southern Oscillation (ENSO). Years of low snowpack often follow El Nino years which means the PNW receives less precipitation during El Nino years (Redmond & Koch, 1991).

Documentary records and climate reconstructions show that the forest type that is located in central Idaho is at risk of severe wildfires due to concurrent drought (Balling et al, 1992).

This paper looks at the relationship between precipitation in central Idaho and the number of acres burned of ponderosa pine and mixed conifer forests by wildfires. Wildfires in this area destroy habitat for animals and destroy areas that people in Idaho enjoy using for recreational purposes. Previous studies have highlighted that precipitation is an important driver of the frequency of wildfires (Long et al, 1998). This paper will continue the discussion on the topic and provide new information about central Idaho's risk of large wildfires.

STUDY AREA

Both areas that had data collected from them are SNOTEL sites. Banner Summit SNOTEL site is located on a mountain pass in Boise County (Figure 1) at an elevation of 7040 feet. Banner Summit's mean annual temperature is 43.85°F while the mean annual precipitation is 26.11 inches. More's Creek Summit SNOTEL site is located on a mountain pass in Boise County (Figure 2) at an elevation of 6100 feet. The mean annual temperature for More's Creek Summit is 43.6°F while the mean annual precipitation is 24.06 inches. Both of these sites are in located in central Idaho and are surrounded by ponderosa pine trees and a mixed conifer forest.

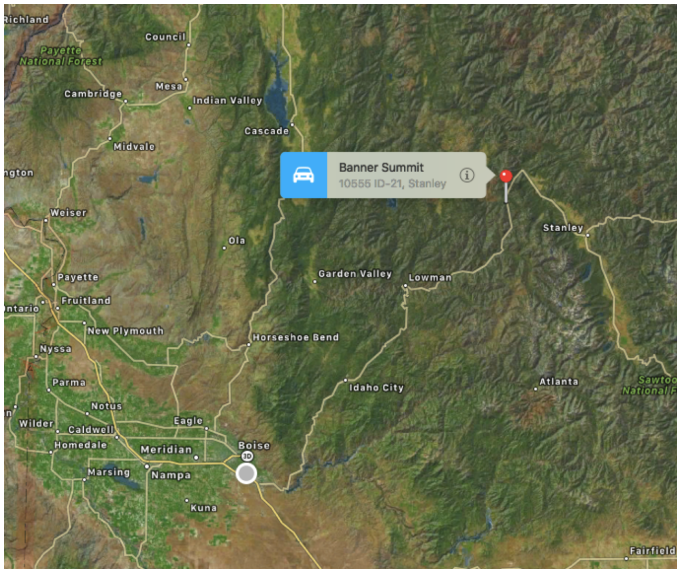

Figure 1

This map shows the geographical location of SNOTEL site Banner Summit located in Boise County, ID. Source: Apple Maps 2017

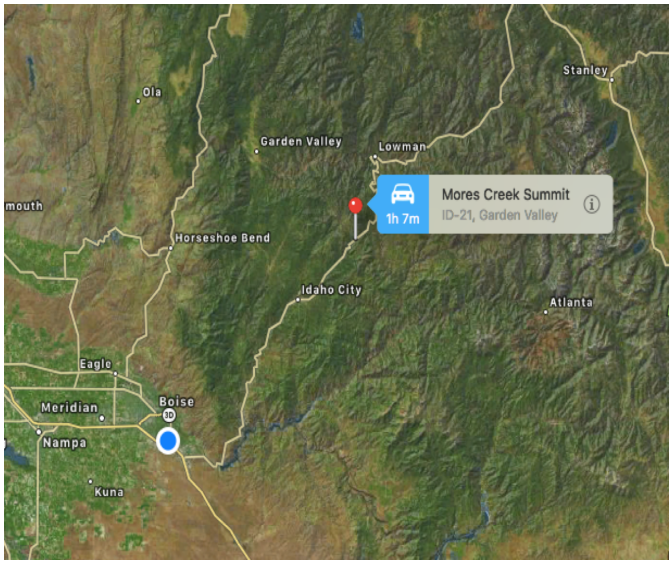

Figure 2

This map shows the geographical location for the Mores Creek Summit SNOTEL site located in Boise County, ID. Source: Apple Maps 2017

METHODS

SNOTEL stands for Snow Telemetry, and is an online database that houses climate-related data for various states across the west. Monthly precipitation data for the years 2002-2016 was taken from the SNOTEL website for two sites, Banner Summit and Mores Creek Summit. This data was then added together to get the annual precipitation data for the sites. Data from 2002-2016 for the acres burned by wildfires in Idaho was taken from the National Interagency Fire Center website. The number of acres burned from 2002-2016 was graphically compared to the amount of precipitation accumulated annually for that same time period.

RESULTS

Annual precipitation at the Banner Summit SNOTEL site for the period 2002-2016 is shown in figure 3. From 2005 to 2006 there is an increase in the precipitation from 30.8 inches to 47 inches accumulated for the year. The next highest precipitation year was 2012 when it reached 43.2 inches. Until 2016 the accumulation of precipitation had stayed below 40 inches.

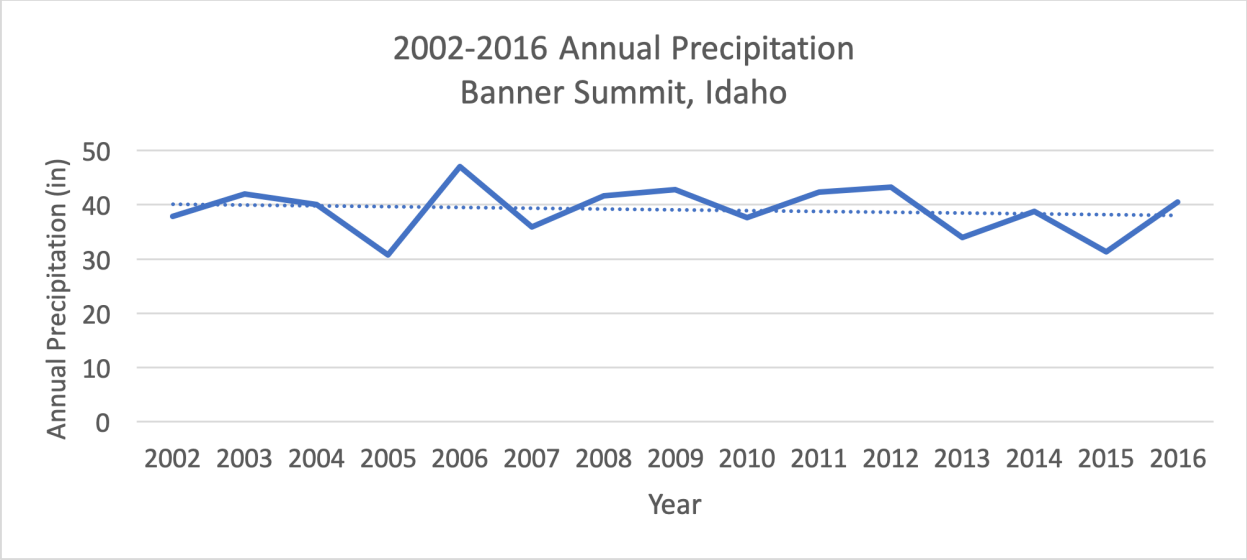

Figure 3

This graph shows the annual precipitation at the SNOWTEL site at Banner Summit, Idaho. The data ranges from 2002-2016 and shows a decreased average. Graph adapted from: (USDA 1) https://wcc.sc.egov.usda.gov/reportGenerator/view/customGroupByMonthReport/monthly/312:ID:SNTL%7Cid=%22%22%7Cname/POR_BEGIN,POR_END/PREC::value

The annual precipitation for the Mores Creek Summit SNOTEL site is shown in figure 4. Similar to figure 3 the biggest difference from one year to the next occurs from 2005-2006 when the precipitation went from 31.9 inches to 55.9 inches. From 2007-2010 there was not a huge changed in the annual precipitation, in 2011 the precipitation reached its highest point since 2006 with 56.4 inches accumulated. After 2011 there was a steady decrease for 2 years until it rebounded and began to grow again in 2014.

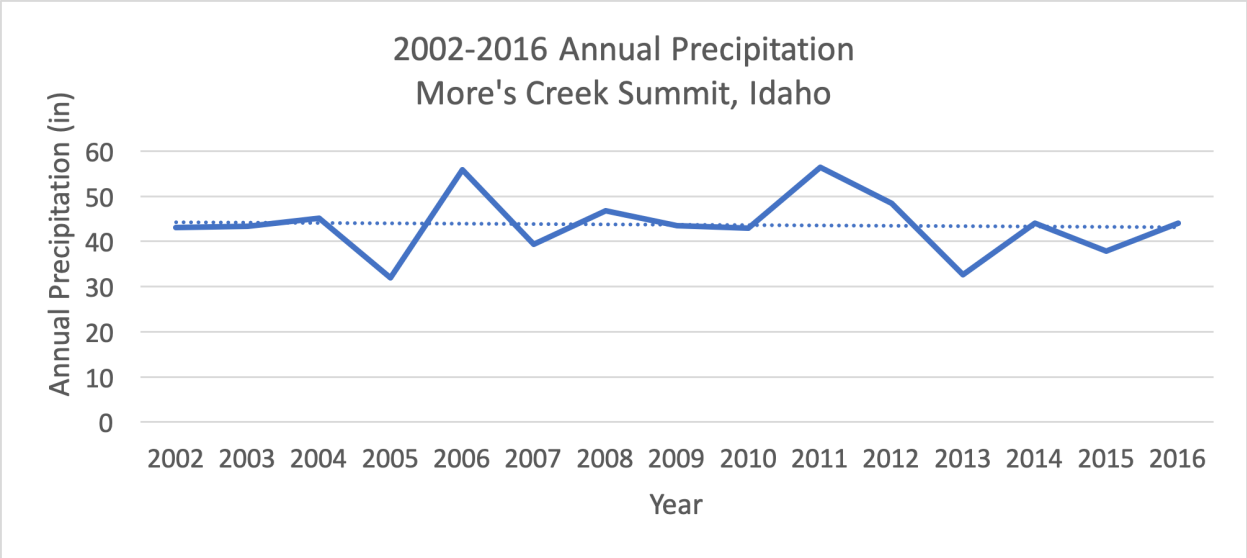

Figure 4

This graph shows the annual precipitation at the SNOTEL site Mores Creek Summit, Idaho. The data includes years 2002-2016 and shows no change in the average. Graph adapted from: (USDA 2) https://wcc.sc.egov.usda.gov/reportGenerator/view/customGroupByMonthReport/monthly/637:ID:SNTL%7Cid=%22%22%7Cname/POR_BEGIN,POR_END/PREC::value

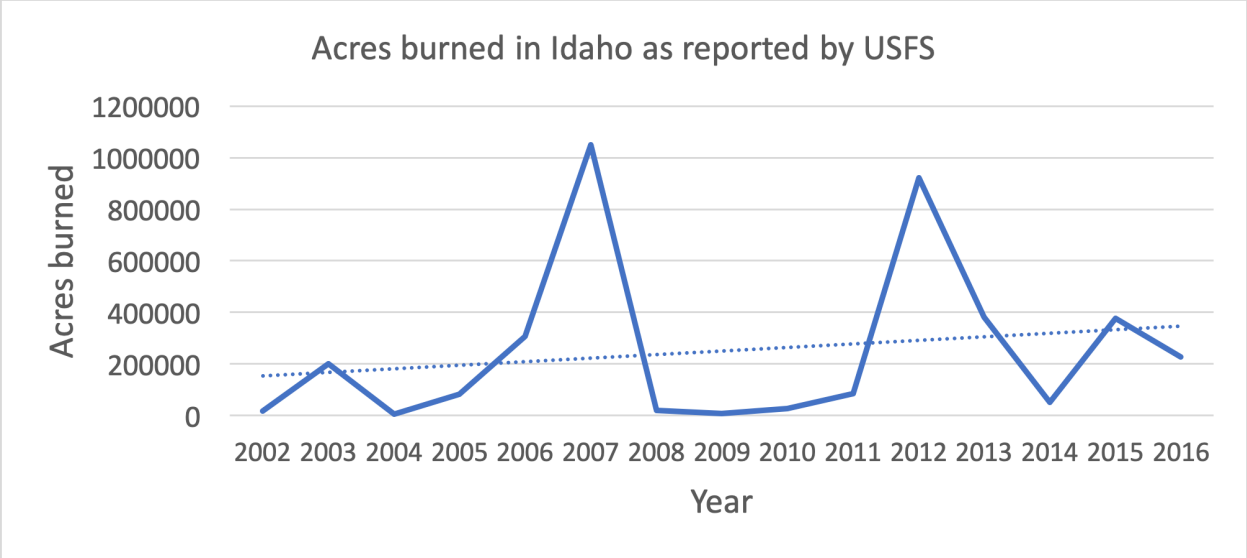

Figure 5

This graph shows the acres burned by wildfires in Idaho as reported by the U.S. Forest Service. The data ranges from 2002 to 2016. The trend line shows that acres burned have increased in the span. Graph adapted from: https://www.nifc.gov/fireInfo/fireInfo_statistics.html

The number of acres burned by wildfires of U.S. Forest Service land in Idaho is shown in figure 5. This graph covers a 16-year time span and shows great variability from year to year. From 2004 to 2007 the number of acres burned seems to grow exponentially and then undergoes a massive drop off the next year. This trend occurs again from 2011 when it grows to 921,347 acres burned in 2012 and then drops all the way down to 50,713 acres burned in 2014.

DISCUSSION

This paper is meant to show the relationship between the amount of precipitation an area receives and the number of acres burned in the same year. The ongoing discussion highlights central Idaho's risk of having large wildfires occur. Figures 3 & 4 show that during 2006, both the Banner Summit and Mores Creek Summit sites received more than 46 inches of precipitation. Data for 2007 from the USFS graph shows 1,050,025 acres being burnt that year. This relationship occurred again in 2011 when the precipitation accumulated reached 41 + inches for both the Banner Summit site and Mores Creek site. The following year 921,347 acres were burned according to the USFS. The relationship described is not normal. Normally an area that had gotten a lot of precipitation would not burn easily. However, the precipitation inspires more underbrush growth and increases the amount of fuel the forest contains (Redmond & Koch, 1991). Therefore, when the forest begins to burn the greater amount of fuel feeds a bigger fire.

In the past, domesticated animal grazing has decreased the frequency of fires due to the consumption of herbaceous fuels that carry low-severity fires in mixed conifer forests in the PNW (Rummell, 1951). The forests of central Idaho are mixed conifer forests and there would likely be a buildup of herbaceous fuels without grazing animals in the region. For this type of forest specifically, land-use history is an important factor for wildfire risk as that gives researchers background information about past fuel management strategies (Westerling, 2006).

The El Nino Southern Oscillation affects the PNW and SW differently during the same year. During El Nino years the PNW receives less snowpack cover which leads to greater fire spread. However, in the South West, heavy rainfall suppresses fires but generates buildup of herbaceous fuels in ponderosa pine forests (Redmond & Koch, 1991). A reduction in snowpack cover can lead to drier summers, an increase in the length of the fire season and an increase in

the potential for large fires (Heyerdahl, et al, 2002). In short, El Nino years show an indication of what type of fire season to expect for the upcoming year. This is helpful when government agencies are allocating resources in order to pre-burn areas and fight wildfires once they start.

Figures 3 & 4 show a decreasing average of annual precipitation accumulated. Figure 5 shows an increasing average in the number of acres burned per year. With climate fluctuating toward warmer temperatures data collected can predict that fires should continue to burn in central Idaho as long as there is a continued decrease in precipitation. Even with more precipitation, fires would most likely still occur due to an increase in fuel. In order to combat this increase in acres burned, proper fire suppression measures would need to be put in place to manage fuel amounts in mixed conifer forests of central Idaho.

CONCLUSION

From 2002-2016, the Banner Summit and Mores Creek Summit data indicate a decreasing trend of annual precipitation. Over that same time span data collected by the U.S. Forest Service shows an increasing trend in the number of acres burned annually by wildfires. If these trends continue, mixed conifer forests will likely continue to burn and have an impact on the local ecosystems.

The El Nino Southern Oscillation will continue to affect the PNW climate either producing dry summers or wet winters. This affects wildfire season length as well as the potential severity of the wildfires. Although central Idaho has experienced a decrease in annual precipitation, this does not mean mixed conifer forests will be completely destroyed. With proper

fire suppression before the fire season begins these areas have a chance to stay around for many decades to come providing habitat for animals and recreation for citizens of Idaho.

Further areas of study might include looking at the effect ENSO on the snowpack in central Idaho, and whether El Nino years produce significantly less snowpack than La Nina years. This would help prepare wildfire scientists to predict future impacts wildfires would have on the region.

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