

## Introduction

Pinyon pine, a keystone species, grows throughout the Great Basin of North America (Dawson, 1993). While its range is not subject to one area of the Great Basin, it predominately grows in xeric conditions near the foothills of high elevation mountains. Shifts in precipitation, due to climate change, affects the distribution of pinyon in Northeastern Nevada. My research will focus on shifting precipitation patterns of pinyon trees. Shifts are distributing pinyons into lower elevation mesic zones which disrupts the ecotones critical to pinyon survival and other flora and fauna. Pinyon distribution is critical to the arid ecosystem and has been historically used as a food and medicine source for the Western Shoshone tribe.

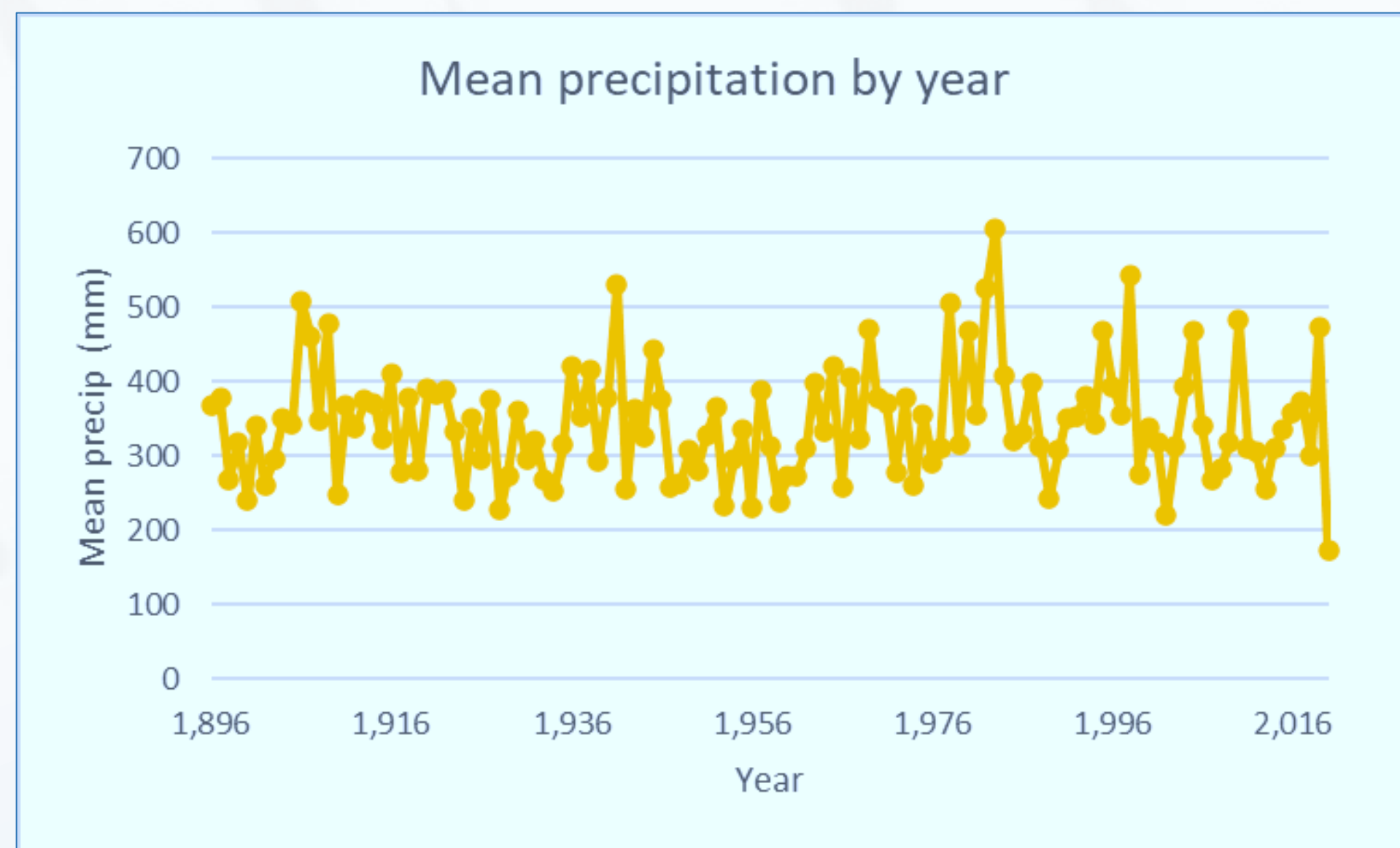


Figure 1. Mean precipitation over the entire range of pinyon pine (Top map of figure1.), data from PRISM.

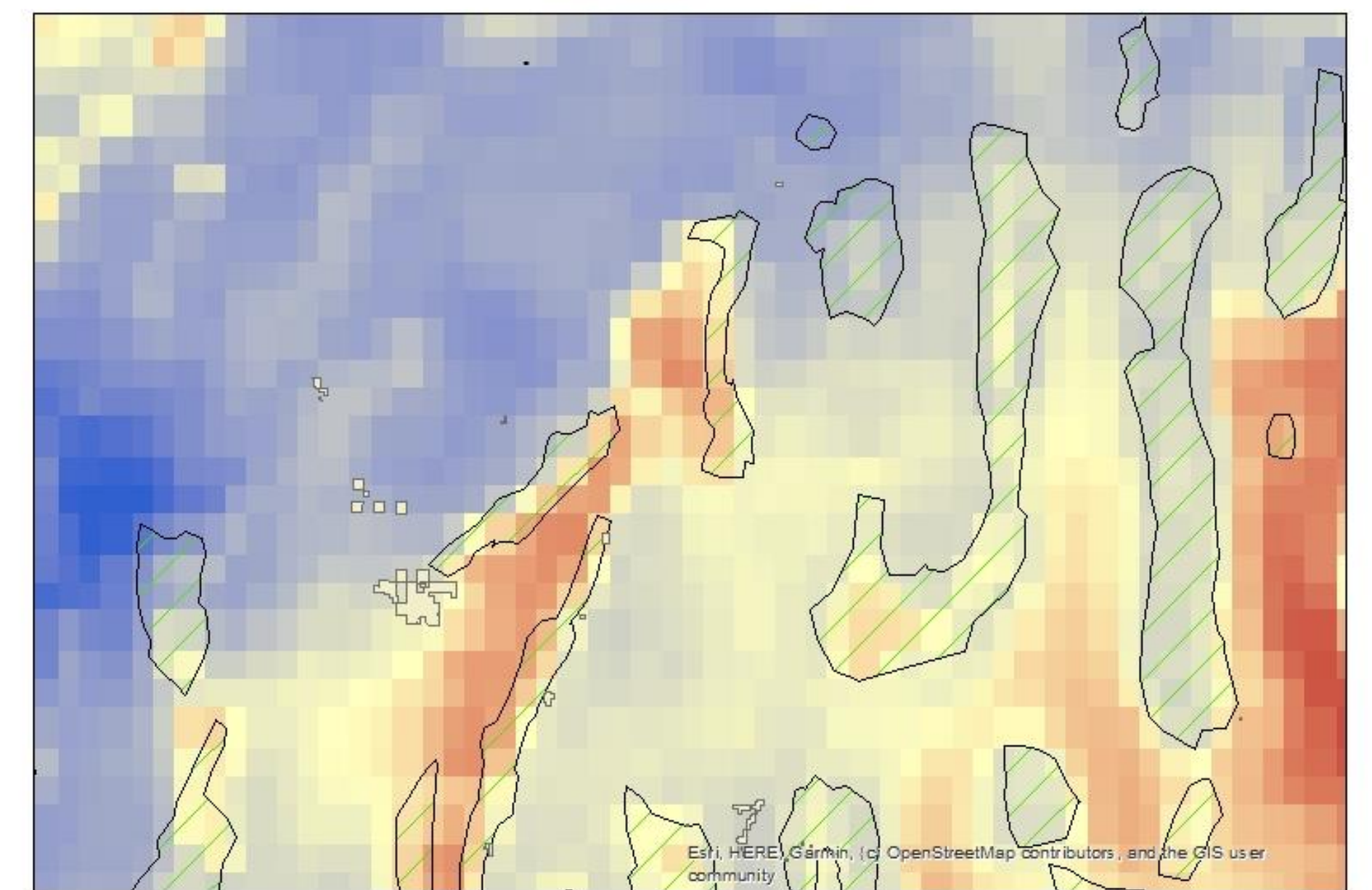
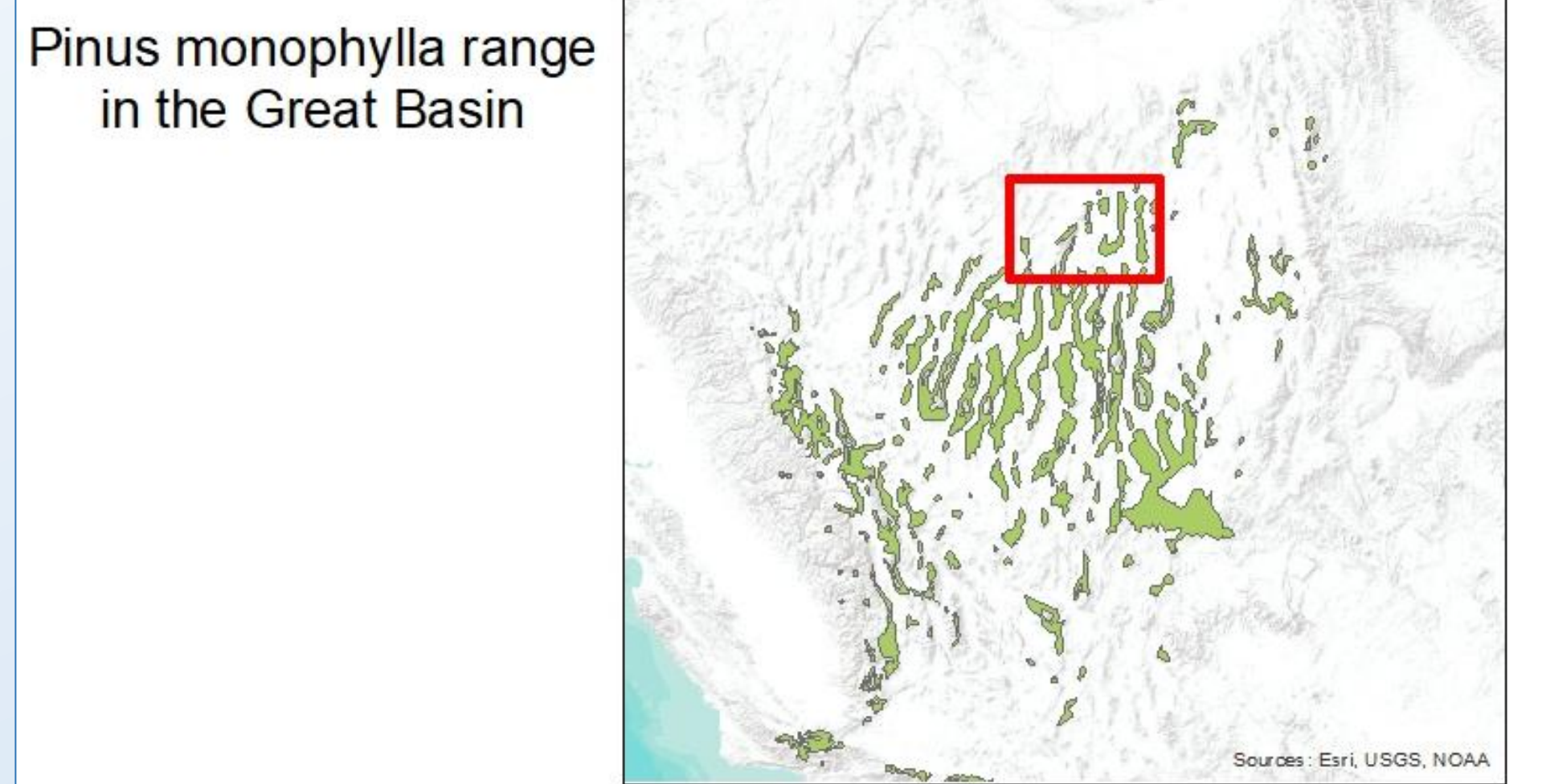


Figure 2. Precipitation change in Northeastern Nevada over the last 125 years.

## Research Question

**How have shifting precipitation patterns altered the distribution of single-leaf pinyon (*Pinus monophylla*) in Northeastern Nevada?**

## Distribution Changes

Distribution changes of *P. monophylla* affects local flora and fauna important to the ecology of the Great Basin in Northeastern Nevada. Ecotone and species distribution shifts affect the availability of traditional foods and medicines. Historical uses of ethnomedicines are well-documented and show the connection between the Western Shoshone (*Newe*) Tribe of Nevada and local flora. In addition, increasing temperature, like precipitation, contributes to the expansion areas of pinyon. To offset the current shifts in distribution, average temperatures would need to decline (Biondi, Bradley, 2013).

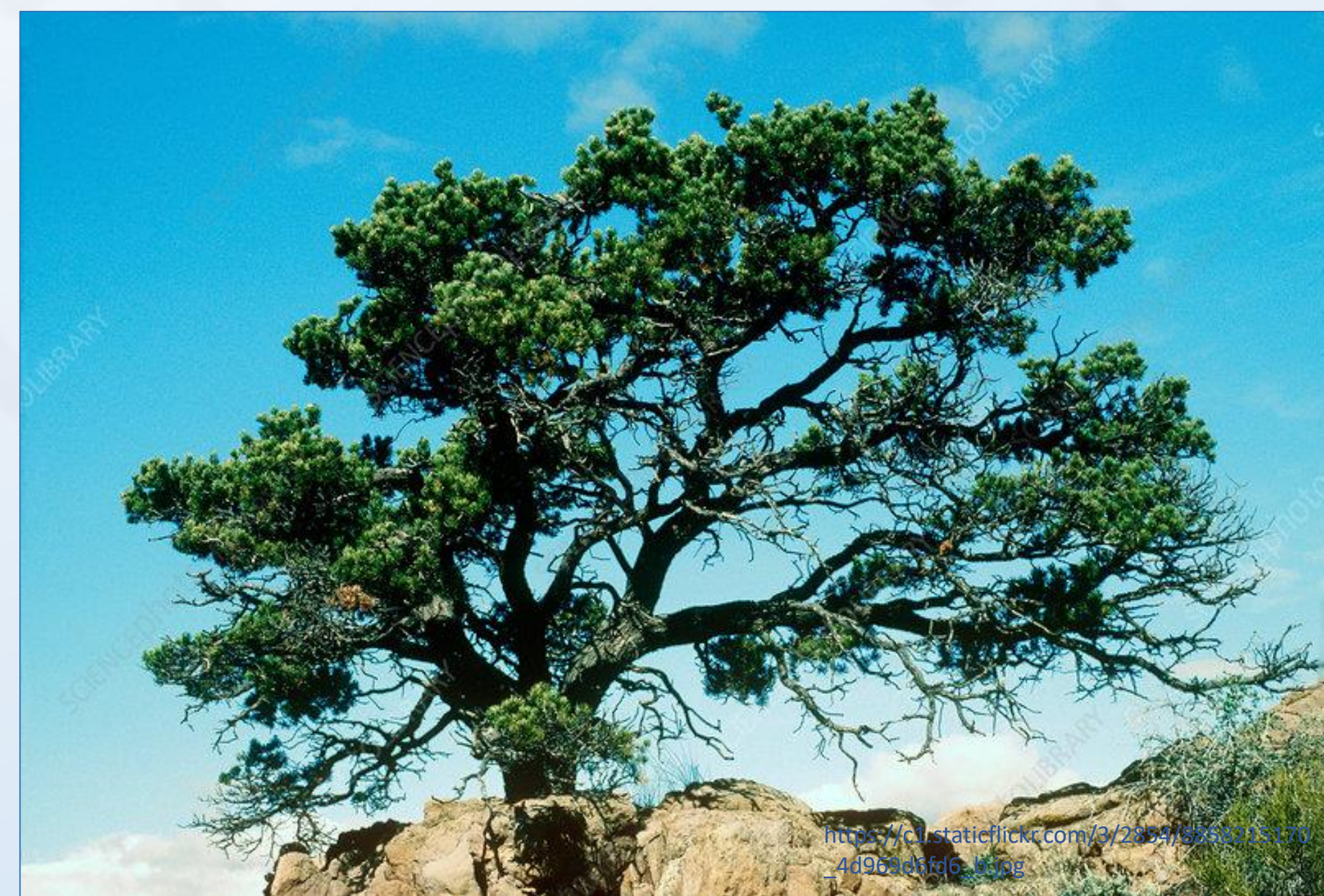


Figure 3. *P. monophylla* in its native xeric habitat.

## Methods

### Climate Data

Previous quantitative data was collected by reviewing PRISM climate data. Like Biondi and Bradley (2013), I will utilize PRISM climate data to analyze each study site's environmental patterns.

### Range Data

USGS data was used to calculate the range of pinyon pine species in different topographic variables. Data was collected by using aerial photos and models used by USGS. Like Weisberg, Lingua, and Pilla (2007), I will use USGS data to analyze the differences in woodland areas for the study range. Three spatial scales of woodland delineation was used to quantify the data.

### Radiocarbon Data

The analysis of radiocarbon dating of pinyon needles was used to identify the age of the needles to see how far the needles were dispersed by packrats. Investigation of carbon dates of the pinyon needles was identified by using the lines to indicate which period the needles were from. Radiocarbon dating uses fossils of the pinyon needles collected from packrat middens. Like Cole, Fisher, Ironside, Mead, and Koehler (2013), I will utilize radiocarbon images and needle identifications to identify species and their range.

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## Cultural Significance

Pinyon pine (*wah-pee* in *Newe*) has been a staple food for the *Newe* tribe for thousands of years. The Bureau of Plant Industry have recognized the importance of pinyon and its plant parts as an ethnobotanical and ethnomedicine of the *Newe* tribe. The seeds of the pinyon are the food source while the resins and pine needles are used in remedies for colds, nausea, venereal disease, chronic indigestion, bowl trouble, and any general muscular soreness (Kay, 1983). Traditional harvesting methods are still used today.



Figure 4. Traditional harvesting of pinyon pinecones by *Newe* tribal members, 1912.



Figure 5. Traditional pine nut harvesting, 2019.

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