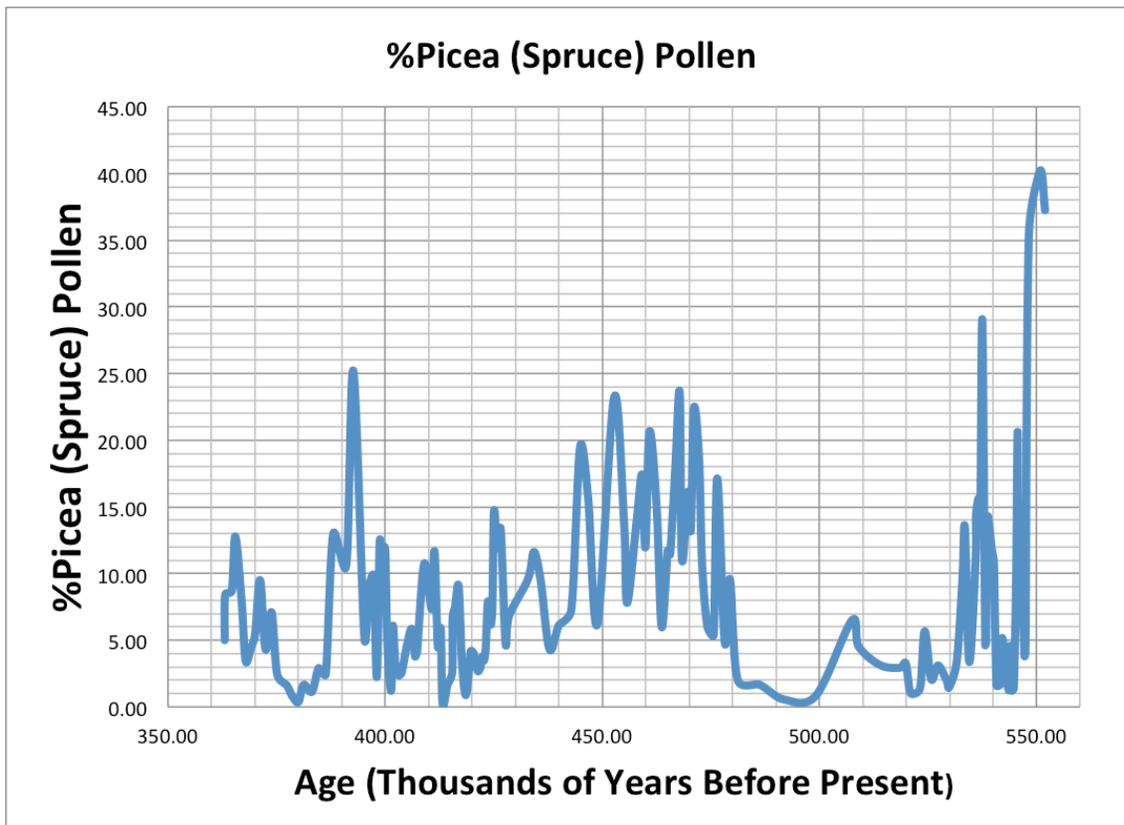
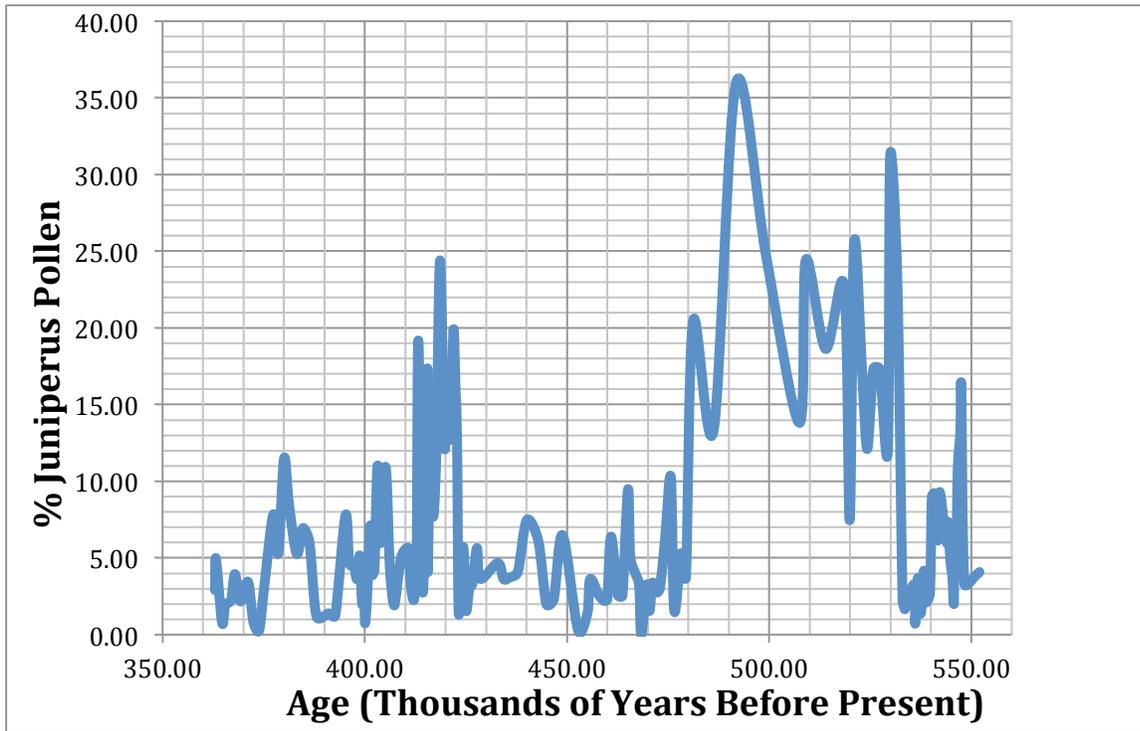


## Teacher's Lab Sheet

What can *Juniperus* Pollen counts found in the Valles Caldera Cores tell us about Paleoclimates?



Graph created from data in the NOAA National Climatic Data Center

<http://www.ncdc.noaa.gov/paleo/pubs/fawcett2011/fawcett2011.html>

that was compiled by: Fawcett, P.J., J.P. Werne, R.S. Anderson, J.M. Heikoop, E.T. Brown, M.A. Berke, S.J. Smith, F.

Goff, L. Donohoo Hurley, L.M. Cisneros-Dozal, S. Schouten, J.S. Sinninghe Damsté, Y. Huang, J. Toney, J. Fessenden, G. WoldeGabriel, V. Atudorei, J.W. Geissman, and C.D. Allen. 2011. Extended megadroughts in the southwestern United States during Pleistocene interglacials. *Nature*, Vol. 470, pp. 518-521, 24 February 2011.  
doi:10.1038/nature09839

The NOAA National Climatic Data Center provides a portal for researchers to share their data on climate. Dr Fawcett and his colleagues have analyzed sediment cores from the Valles Caldera to gain insights into past climates in order to compare and contrast with present day climate trends and to consider future climate changes. The graphs of juniper and spruce pollen is only one tiny slice of the picture that proxy data can offer.

Go to the portal <http://www.ncdc.noaa.gov/paleo/pubs/fawcett2011/fawcett2011.html> and make a list of the different kinds of data Dr Fawcett and his colleagues have recorded.

**Answers:**

1. Depth vs Mean Average Temperature (MAT), pH, Si to Ti Ratios, Ca count, total organic carbon, pollen counts, Carbon to Nitrogen ratio, and more.

2. In the pollen counts what were some of the other pollens? Describe the plant that produced the pollen? Do a web search to find out what the plant looks like and then decide if the plant would be an indicator of a drier or wetter climate.

**Answers: (students will have varying answers)**

Picea

Abies

Juniperus

Quercus

Cyperaceae

Rosaceae

Artemisia

Using the pollen graphs of Picea (Spruce) and Juniperus (Juniper) answer the following questions.

3. Juniperus pollen was (on the rise or on the decline) 490 kyBP? Circle one

Answer: on the rise

4. Picea (Spruce) pollen was (on the rise or on the decline) 490 kyBP? Circle one

Answer: on the decline

5. List 3 times where Juniperus pollen was at a low point.

Answer: 372 kyBP, 452 kyBP, 470kyBP

6 List 3 times when Picea pollen was at it's lowest. How do the low points of Picea (Spruce) pollen compare to the Juniperus pollen?

Answers: 380 kyBP, 412 kyBP, 497 kyBP It appears that when Juniperus pollen was high when the Picea was low.

7. When was Juniperus pollen the most abundant and record the approximate %?

Answer: 490 kyBP, 36.5%

8. Do a web search and see what you can find out about glacial period(s) during the Pleistocene. When was the glacial period that would have reached the Valles Caldera?

9. Would you predict that the climate was colder or warmer at 550 kyBP than at 490 kyBP? Explain your answer.

Answer: colder at 550 kyBP since the Picea (Spruce) was thriving and during 490 kyBP the % of Picea pollen was not as prevalent. Picea (Spruce) requires a cooler climate to thrive and Juniperus thrives in warmer conditions as compared to Picea.

You can see how paleontologist can use pollen as a proxy to “speak” for paleoclimate (old climate). Select another proxy from the data at <http://www.ncdc.noaa.gov/paleo/pubs/fawcett2011/fawcett2011.html> and use Excel to graph the data.