

## Climate Change in the San Juan Mountains Pre-Assessment

1. What do you know or have you heard about climate change in western Colorado in relation to recreational activities?

*A student should describe any kind of climate change issue he/she has heard of in their region that is affecting any recreational or economic activities.*

2. What observations have you made about climate change effects in the San Juan region?

*This can be any effects that climate change is having in the region such as dust on snow, pine beetles, etc.*

3. What geographic features influence the climate of a region?
  - a) Earth's tilt
  - b) Latitude and longitude
  - c) Elevation
  - d) Water bodies
  - e) All of the above

*E is correct, and a short discussion could be had on why, but lesson 2 will cover these materials in-depth. Here is some background on the topic:*

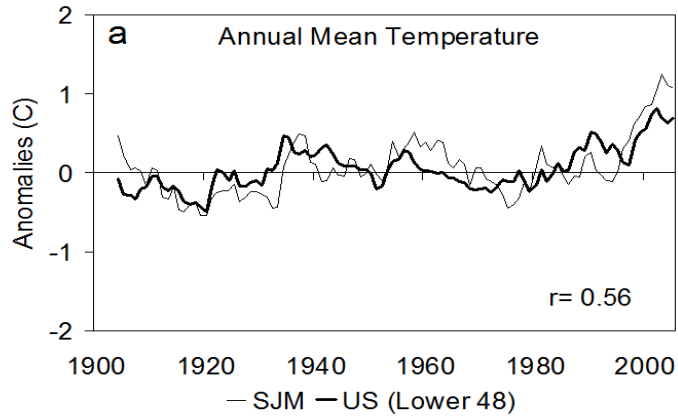
*[http://www.climateandweather.net/global\\_warming/influence\\_climate.htm](http://www.climateandweather.net/global_warming/influence_climate.htm)*

4. Describe your understanding of weather and climate:

*This answer should include anything along the lines of weather being short-term events and climate being long term averages.*

5. Graph Interpretation: Identify and compare the trends that you see between the San Juan Mountains and the US as a whole. When have the warmest years occurred? How have temperatures changed in the past 30 years?

*This should just be a description of trends in the graph. Example: "from 1900 to 1940 the rest of the United States appears to be warming more quickly, and in the 1960s the San Juan Mountains began to rapidly warm at an increasing rate"*



6. Plot the following climate data on a line graph, and then average the temperatures to find the average temperature for the day and record your answer.

***April 2, 2013 Durango, CO hourly temperatures***

<i>Hour</i>	<i>Temp (F)</i>	<i>Hour</i>	<i>Temp (F)</i>
01	35.0 F	14	54.0 F
02	40.0 F	15	51.0 F
03	37.0 F	16	55.0 F
04	33.0 F	17	54.0 F
05	31.0 F	18	49.0 F
06	28.0 F	19	46.0 F
07	26.0 F	20	46.0 F
08	25.0 F	21	44.0 F
09	29.0 F	22	40.0 F
10	39.0 F	23	38.0 F
11	46.0 F	24	34.0 F
12	50.0 F		
13	55.0 F		

*The student should add all the numbers together and divide by 24. = 41.0416667*

7. The Greenhouse effect is a natural process where thermal radiation coming from the earth's surface is absorbed by certain atmospheric gases. This effect warms the atmosphere and causes it to emit thermal radiation both upward and back downward toward the surface.
8. Historic climate records can be deciphered from tree rings: T F
9. At high-elevation weather stations what types of data are collected, and why is it unique to mountain ecosystems?

*Snowpack data, maximum and minimum temperatures, snow-water equivalent*

10. How do humans contribute to the amount of CO<sub>2</sub> levels in the atmosphere? (circle all that apply)
- a) Burning fossil fuels
  - b) Driving
  - c) Producing hydropower
  - d) Grazing
  - e) Deforestation

*Good discussion topics: Technically, just a, b, and c are correct but secondarily grazing could produce some amounts of CO<sub>2</sub>, but they really contribute methane, another greenhouse gas, to the atmosphere. Hydropower does not produce CO<sub>2</sub> after construction, but the building of the dam contributes to a lot of CO<sub>2</sub> emissions. Deforestation can cause CO<sub>2</sub> levels to increase by removing trees that would be drawing CO<sub>2</sub> out of the atmosphere.*

11. Describe what a feedback loop is in terms of an earth-atmosphere system, and give an example:

*A feedback loop occurs when an initial change in a climate variable causes other changes that ultimately enhance (positive feedback) or reduce (negative feedback) the change in the initial variable. The sea ice-albedo feedback in the Arctic works as follows: an initial increase in surface air temperature will melt sea ice which decreases the reflectivity (albedo) of the sea surface and allows more solar radiation to be absorbed in the water thus increasing the water temperature and then warms the atmosphere even more. This is a very strong positive feedback in the climate system.*

12. The precipitation gathered on mountains provides water for much of the world's population<sup>1</sup>:  
   F

13. Describe how dust on top of snow contributes to climate change and water resources:

*When dust blows in from the deserts to the west onto the mountains and settles on the snow, the reflectivity of the surface will decrease, and snow will absorb more heat and therefore melt more quickly in the spring.*

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<sup>1</sup> M.F. Price. Food and Agriculture Organization of the United Nations. *Mountains: Globally Important Ecosystems*.