

Climate Change Trends for Planning at Bryce Canyon National Park

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March 29, 2012

Historical Trends

During the 20th century, temperature has increased across North America (Figure 1) and shown a statistically significant increase in the immediate area surrounding Bryce Canyon National Park (Figure 2, Table 1). Precipitation has decreased across the southwestern U.S. (Figure 3), including the area surrounding the park (Figure 4), but the trend is not statistically significant.

Future Projections

The Intergovernmental Panel on Climate Change (IPCC) has coordinated research groups in projecting possible future climate under defined greenhouse gas emissions scenarios (IPCC 2007). Current global emissions are at or above IPCC emissions scenario A2. For the three main IPCC emissions scenarios, temperature could increase six to nine times the warming already observed (Table 1). Precipitation could increase in the 150 km x 150 km area surrounding the park, but, for the area of the park, 12 out of 18 General Circulation Models project decreases in precipitation for IPCC emissions scenario A2 (Figure 5; data from Conservation International using method of Tabor and Williams (2010)).

References

- Gonzalez, P., R.P. Neilson, J.M. Lenihan, and R.J. Drapek. 2010. Global patterns in the vulnerability of ecosystems to vegetation shifts due to climate change. *Global Ecology and Biogeography* 19: 755-768.
- Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: The Physical Science Basis*. Cambridge University Press, Cambridge, UK.
- Mitchell, T.D. and P.D. Jones. 2005. An improved method of constructing a database of monthly climate observations and associated high-resolution grids. *International Journal of Climatology* 25: 693-712.
- Tabor, K. and J.W. Williams. 2010. Globally downscaled climate projections for assessing the conservation impacts of climate change. *Ecological Applications* 20: 554-565.

Table 1. Bryce Canyon National Park. Historical and projected climate (mean $\pm$ standard deviation (SD)) for a 150 km x 150 km square area surrounding the park (Mitchell and Jones 2005, IPCC 2007, Gonzalez et al. 2010).

	mean	SD	units
Historical			
temperature 1901-2002 annual average	8	0.7	°C
temperature 1901-2002 linear trend	0.5	0.2	°C/century
precipitation 1901-2002 annual average	330	37	mm/year
precipitation 1901-2002 linear trend	-6	4	%/century
Projected			
IPCC B1 scenario (lower emissions)			
temperature 1990-2100	3.0	0.1	°C/century
precipitation 1990-2100	0	1	%/century
IPCC A1B scenario (medium emissions)			
temperature 1990-2100	3.9	0.1	°C/century
precipitation 1990-2100	6	1	%/century
IPCC A2 scenario (higher emissions)			
temperature 1990-2100	4.6	0.1	°C/century
precipitation 1990-2100	11	1	%/century

Figure 1.

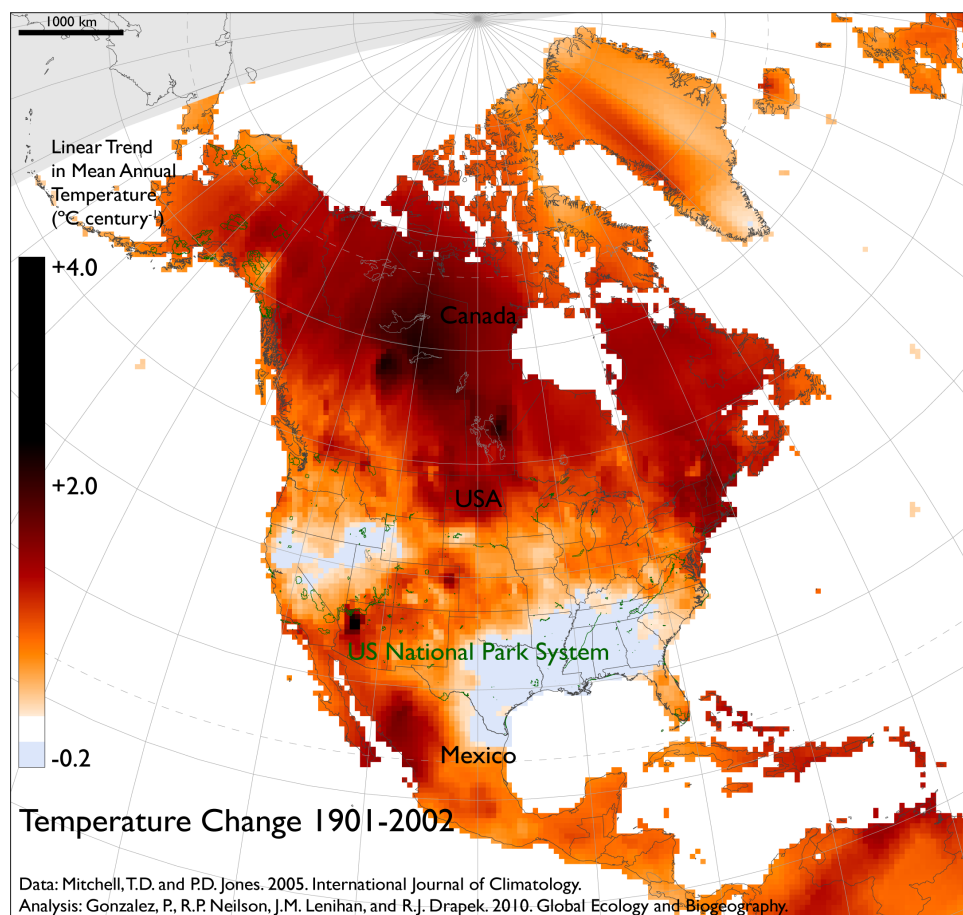


Figure 2.

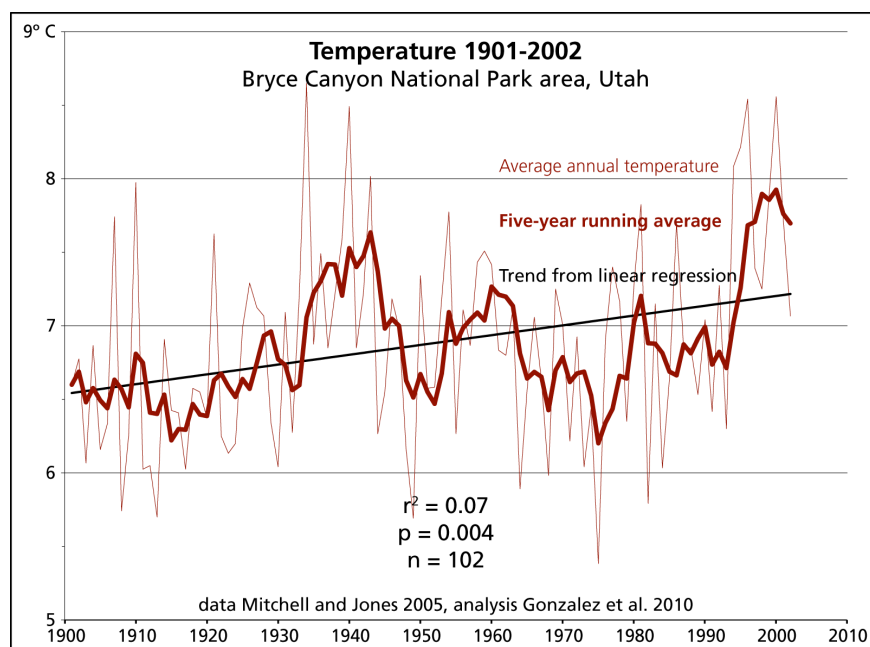


Figure 3.

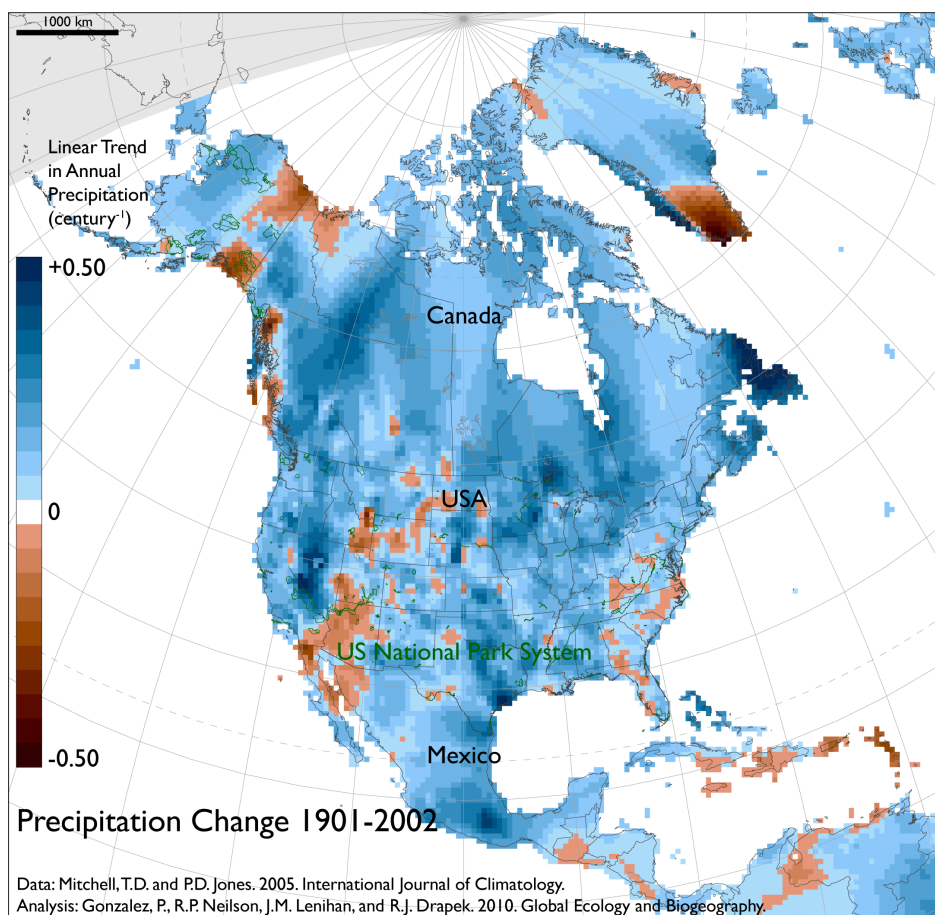


Figure 4.

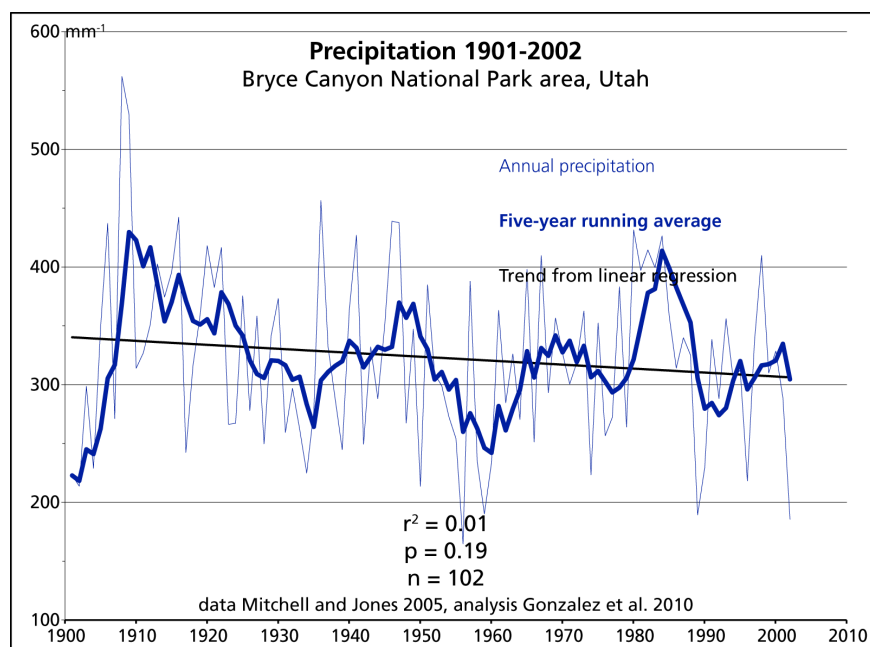


Figure 5.

