

Climate Change Trends for Planning at Timuacan Ecological and Historic Preserve and Fort Caroline National Memorial, Florida

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Historical Trends

From 1901 to 2002, mean annual temperature increased across North America (Figure 1; Gonzalez et al. 2010). In the 50 km x 50 km area that includes Timuacan Ecological and Historic Preserve (EHP) and Fort Caroline National Memorial, mean annual temperature decreased slightly, but the change was not statistically significant (Figure 2, Table 1; Gonzalez et al. 2010). From 1901 to 2002, precipitation increased across most of North America (Figure 3; Gonzalez et al. 2010), including the 50 km x 50 km area including Timuacan EHP (Figure 4, Table 1; Gonzalez et al. 2010), although the trend in the area around Timuacan was not statistically significant. Analyses of causal factors attribute 20th century warming and precipitation changes to greenhouse gas emissions from vehicles, power plants, deforestation, and other human activities (Intergovernmental Panel on Climate Change (IPCC) 2007, Bonfils et al. 2008).

Future Projections

The Intergovernmental Panel on Climate Change (IPCC) has coordinated research groups to project possible future climates under defined greenhouse gas emissions scenarios (IPCC 2007). The three main IPCC greenhouse gas emissions scenarios are B1 (lower emissions), A1B (medium emissions), and A2 (higher emissions). Actual global emissions are on a path above IPCC emissions scenario A2 (Friedlingstein et al. 2010).

For the three main IPCC emissions scenarios, temperature could increase 2.1-3.5°C (Table 1, Mitchell and Jones 2005, Gonzalez et al. 2010). General circulation models (GCMs) of the atmosphere project, on average, only small changes in annual precipitation under all three emissions scenarios (Table 1, Mitchell and Jones 2005, Gonzalez et al. 2010). For emissions scenario A2, the average projected change in annual precipitation is zero, although 10 out of 18 GCMs project increases in precipitation (Figure 5; historical average from Mitchell and Jones 2005, Hijmans et al. 2005; projections from IPCC 2007, Tabor and Williams 2010, Conservation International; analysis by P. Gonzalez).

References

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Table 1. Historical and projected climate (mean $\pm$ standard deviation (SD)) trends for Timuacan EHP and Fort Caroline National Memorial (Mitchell and Jones 2005, IPCC 2007, Gonzalez et al. 2010) and historical trends for the weather station at the Jacksonville, Florida airport. Climate projections for IPCC emissions scenarios B1 and A1B calculated at 50 m spatial resolution (Gonzalez et al. 2010) and, for emissions scenario A2, at 4 km spatial resolution (data from Conservation International using method of Tabor and Williams (2010)). Note “century⁻¹” is the fractional change per century, so that -0.04 century⁻¹ is a decrease of 4% in a century.

	mean	SD	units
Historical			
temperature 1901-2002 annual average	20.1	0.6	°C
temperature 1901-2002 linear trend	-0.1	2.0	°C century ⁻¹
precipitation 1901-2002 annual average	1300	220	mm y ⁻¹
precipitation 1901-2002 linear trend	0.09	0.58	century ⁻¹
Projected			
IPCC B1 scenario (lower emissions)			
temperature 1990-2100 annual average	2.1	0.8	°C century ⁻¹
precipitation 1990-2100 annual average	0.01	0.07	century ⁻¹
IPCC A1B scenario (medium emissions)			
temperature 1990-2100 annual average	3.2	0.8	°C century ⁻¹
precipitation 1990-2100 annual average	-0.04	0.07	century ⁻¹
IPCC A2 scenario (higher emissions)			
temperature 1990-2100 annual average	3.5	0.8	°C century ⁻¹
precipitation 1990-2100 annual average	0	0.07	century ⁻¹

Figure 1.

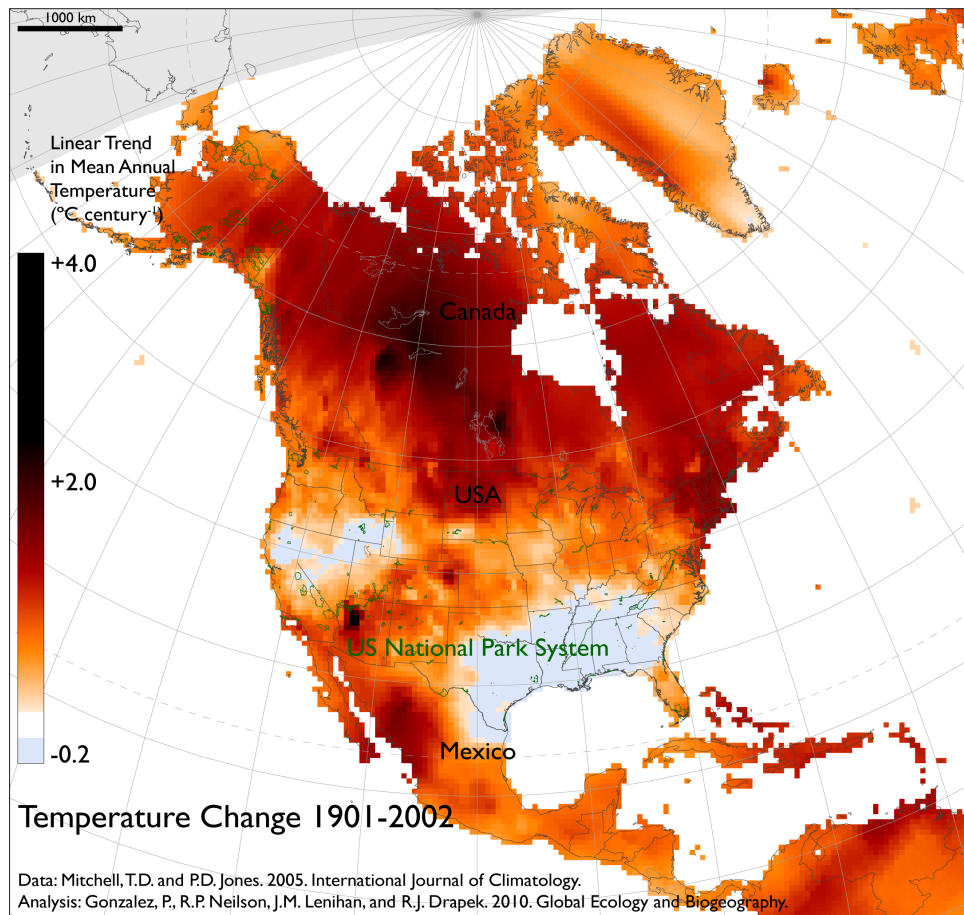


Figure 2.

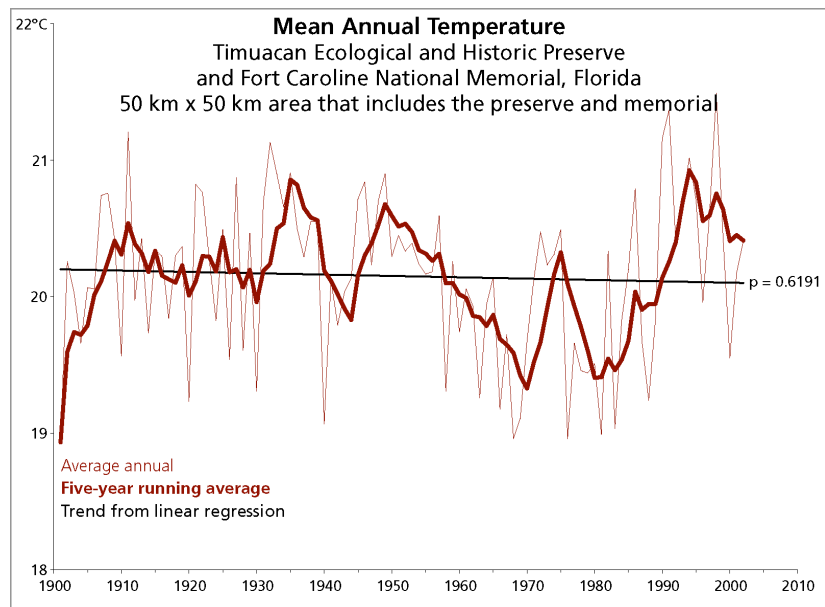


Figure 3.

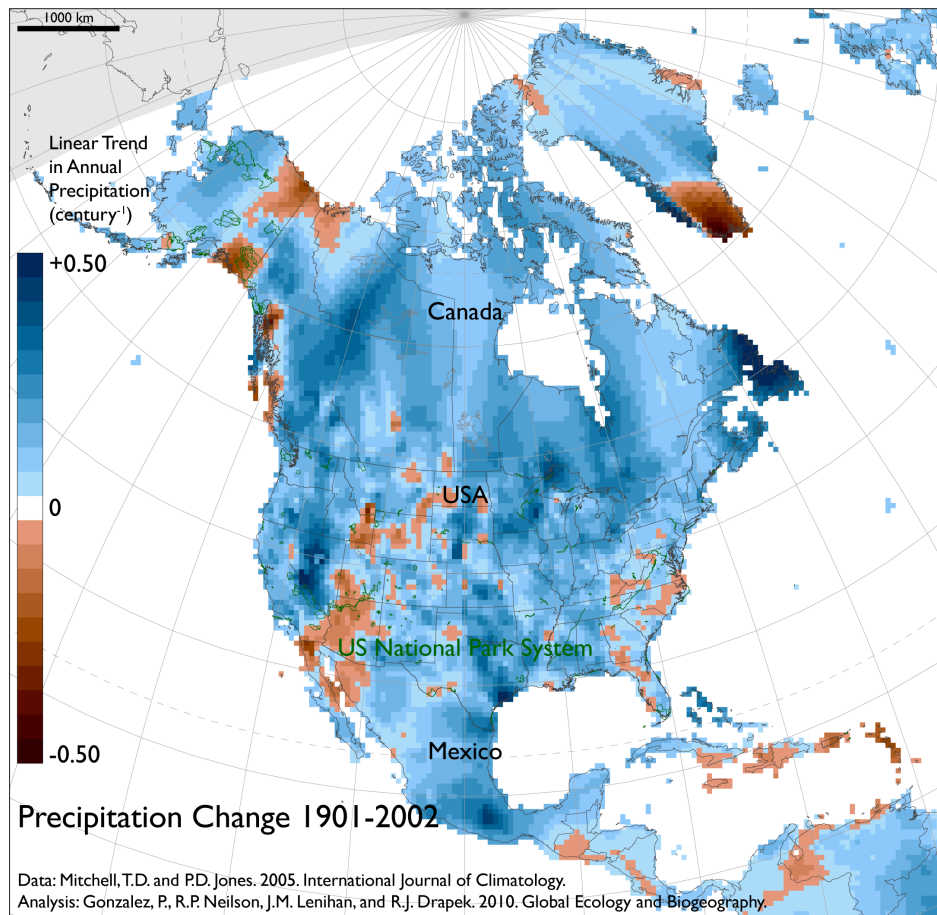


Figure 4.

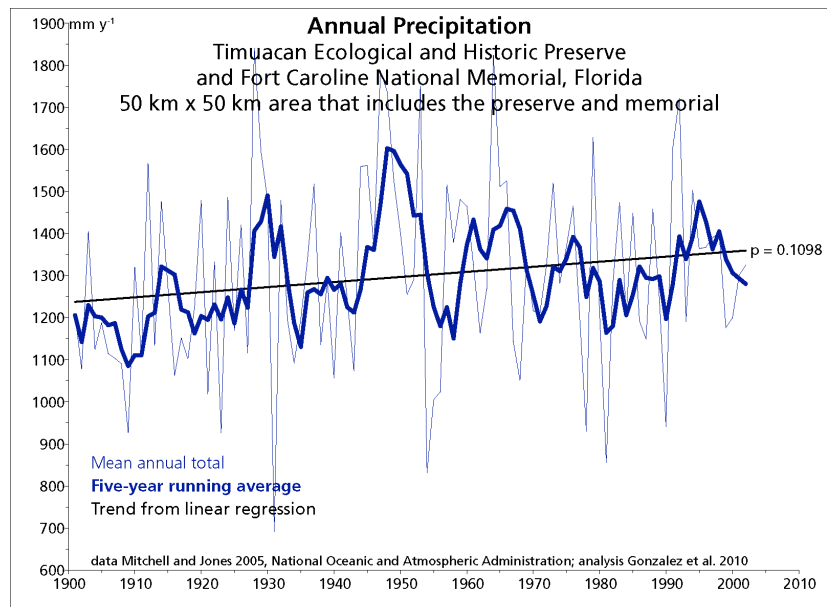


Figure 5.

