Climate Change Summary, Walnut Canyon National Monument, Arizona

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Climate Trends for the Area within Park Boundaries

- Temperature is increasing 1.6ºC (2.9ºF.) per century, a statistically significant trend (Figure 1).
- The historical precipitation trend is not statistically significant (Figure 2).
- Models project future warming up to triple historical rates (Figure 1).
- Future precipitation may increase or decrease (Figure 2).

Table. Historical and projected changes (data Daly et al. 2008, IPCC 2013; analysis Wang et al. in preparation). The table only gives central values. Figures 1 to 3 show the uncertainties.

	1950-2010	**2000-2050**	**2000-2100**
Historical			
Temperature, annual average	+1.6ºC (2.9ºF.)/century		
Precipitation, annual total	+12%/century		
Projected (compared to 1971-2000)			
Low emissions (IPCC RCP 4.5)			
Temperature, annual average		+2.2ºC (4ºF.)	+2.8ºC (5ºF.)
Precipitation, annual total		~0%	+2%
High emissions (IPCC RCP 6.0)			
Temperature, annual average		+1.9ºC (3ºF.)	+3.3ºC (6ºF.)
Precipitation, annual total		~0%	-1%
Highest emissions (IPCC RCP 8.5)			
Temperature, annual average		+2.8ºC (5ºF.)	+5.1ºC (9ºF.)
Precipitation, annual total		~0%	-0%

Potential Future Vulnerabilities for the Southwestern U.S.

- Under high emissions, fire frequencies could increase up to 25% by 2100 (Moritz et al. 2012).
- Drought and beetle infestations have caused extensive tree mortality, which may continue in areas experiencing future drought (Breshears et al. 2005, van Mantgem et al. 2009).
- Past warming has reduced snowpack widely and rainfall in some areas, which may continue to reduce summer streamflow and water supplies (Garfin et al. 2013).

Figure 1. Temperature.
Historical and projected average annual average temperature for the area within park boundaries. For projections, each bar shows one standard deviation above and below the average of up to 33 climate models. (Data: Daly et al. 2008, IPCC 2013. Analysis: Wang et al. in preparation, University of Wisconsin and U.S. National Park Service).

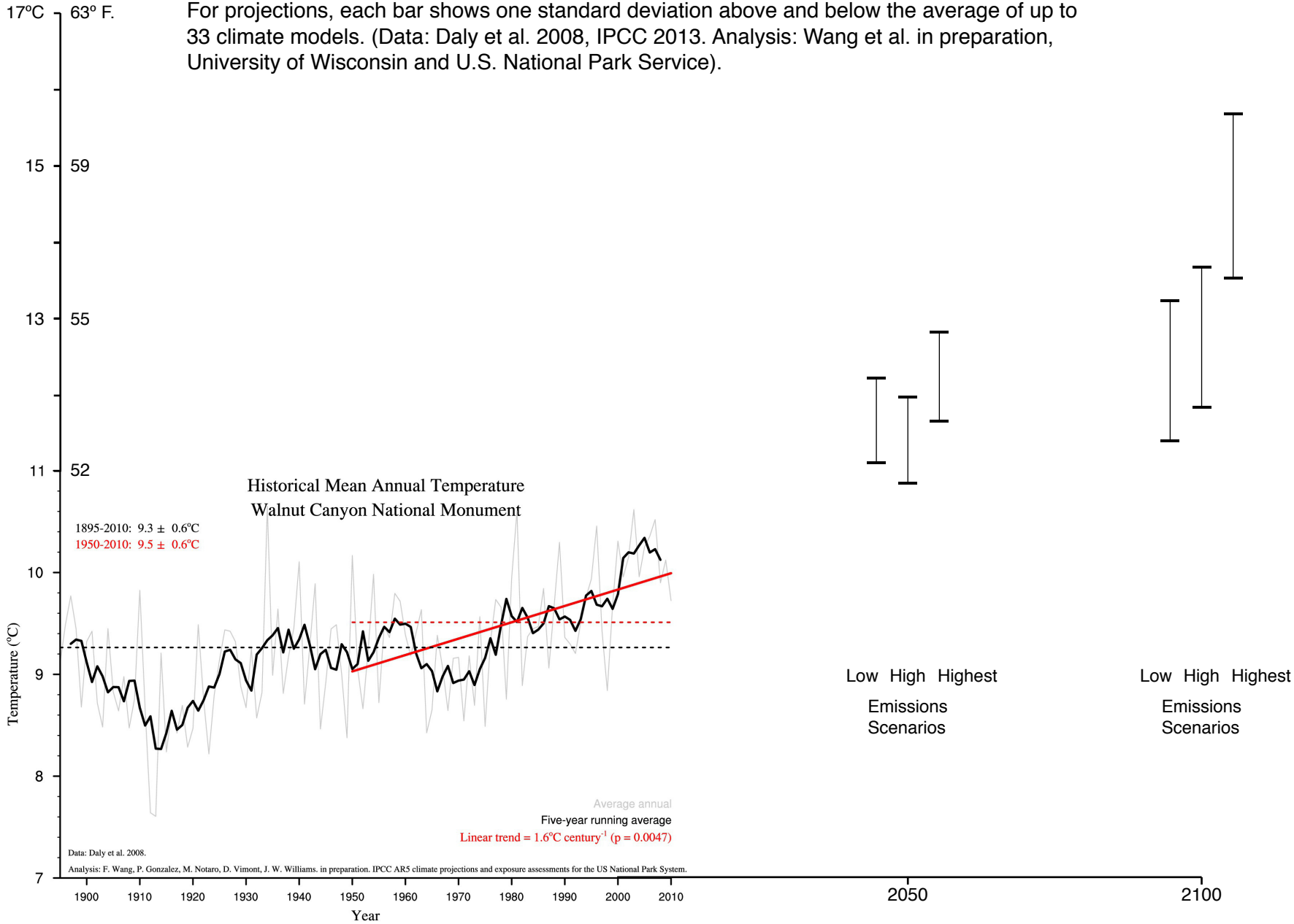
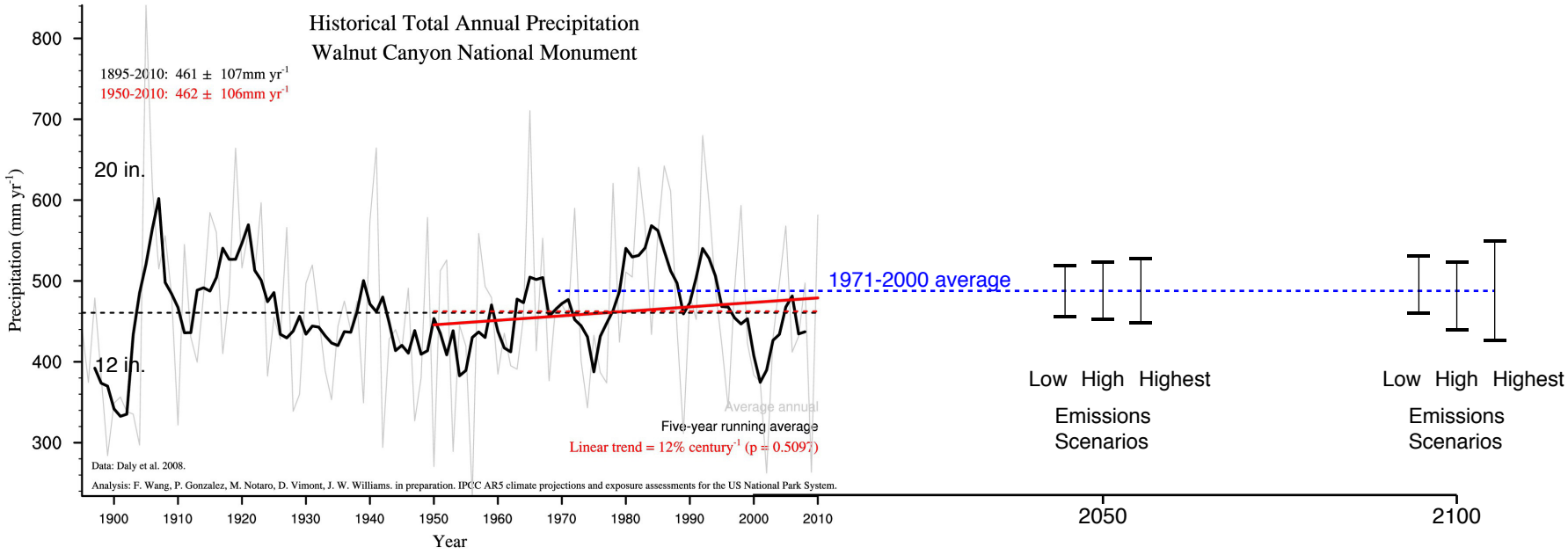


Figure 2. Precipitation.
Historical and projected annual total precipitation for the area within park boundaries.
For projections, each bar shows one standard deviation above and below the average of up to 33 climate models. (Data: Daly et al. 2008, IPCC 2013. Analysis: Wang et al. in preparation, University of Wisconsin and U.S. National Park Service).



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