Impacts of Future Weather Trends on Public Infrastructure Needs and Design

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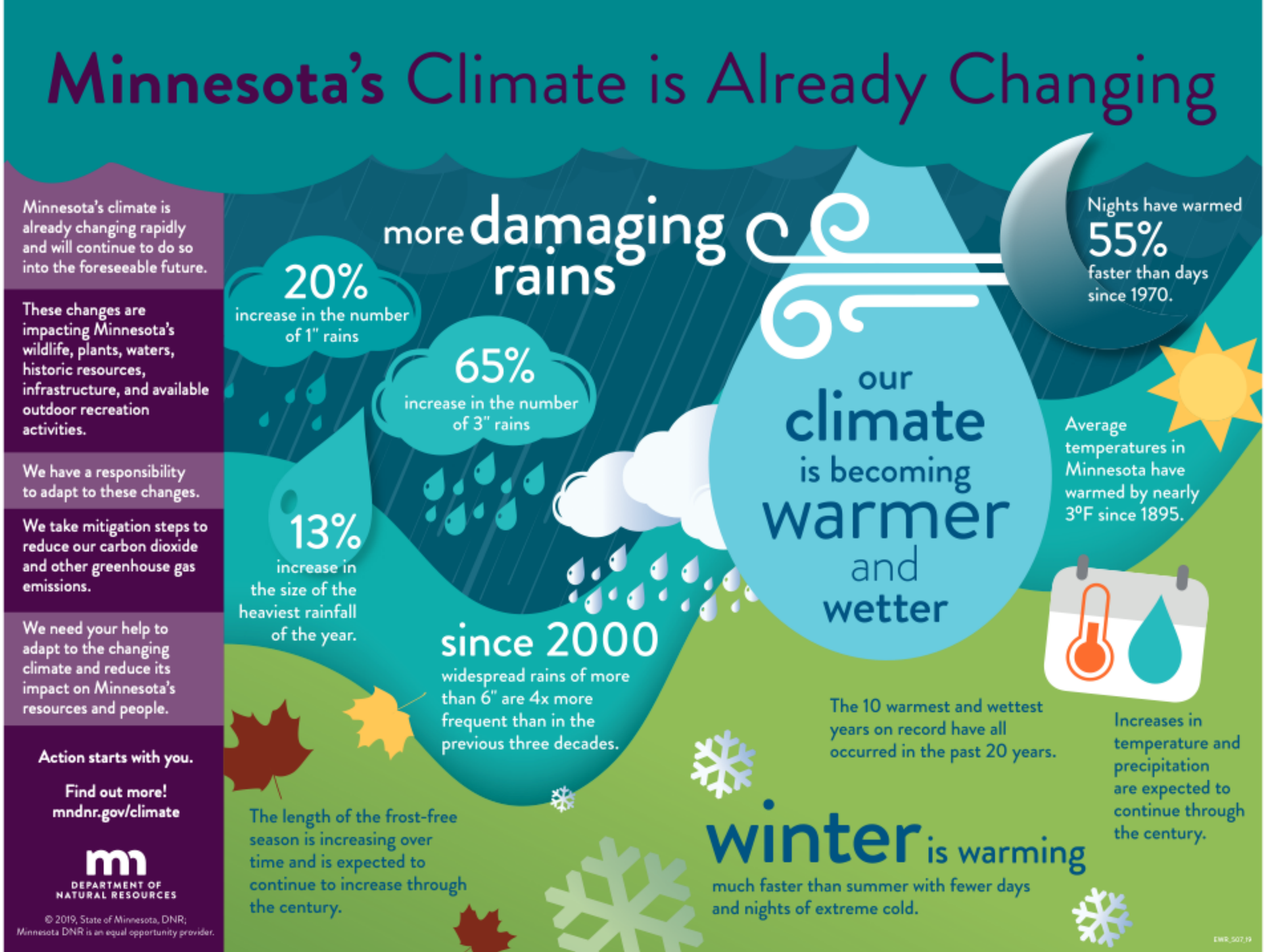
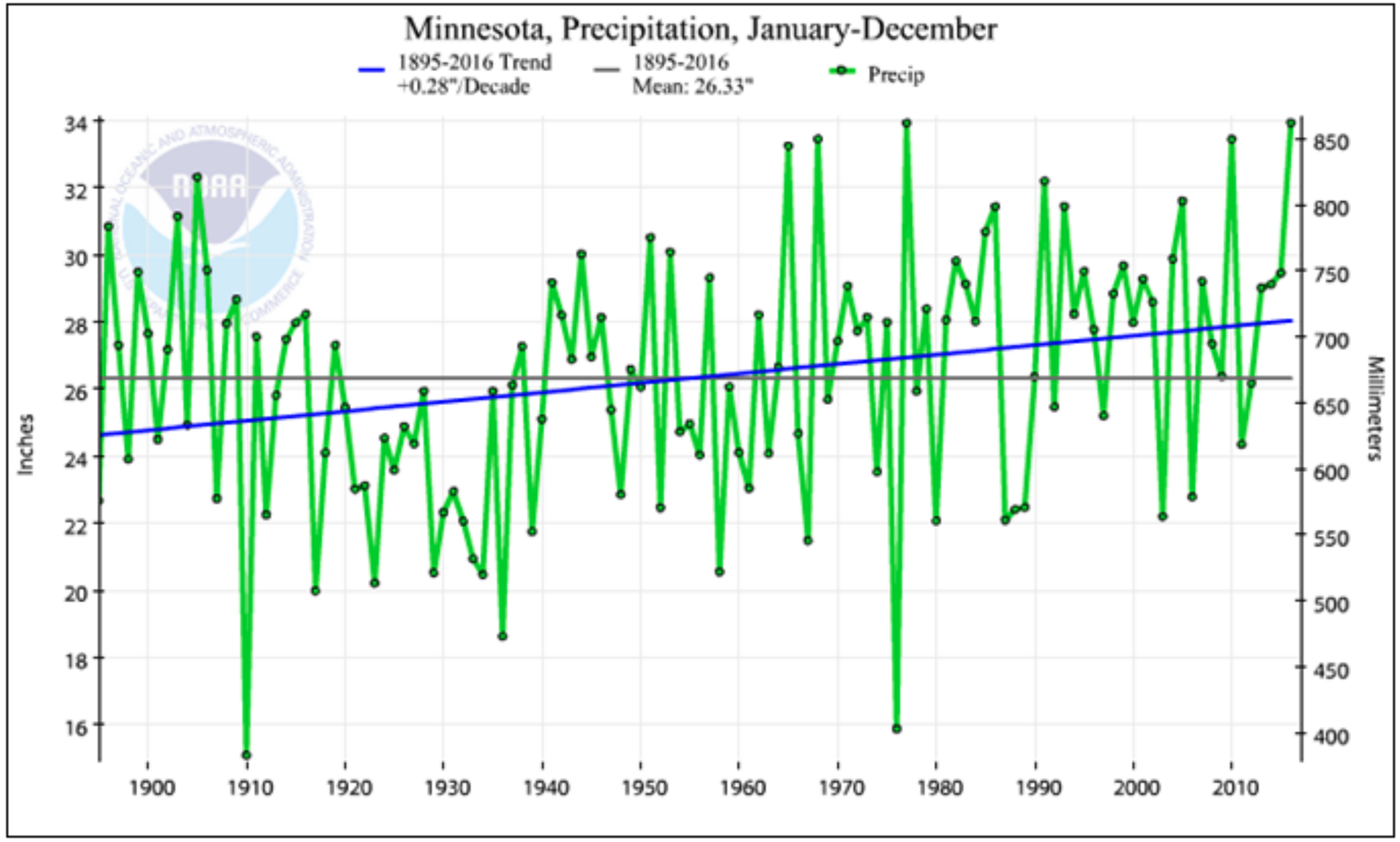
Minnesota's Climate is Already Changing



Potential Future Weather Changes

Precipitation has been increasing in Minnesota over the last century, as shown in the Figure below, which illustrates historic annual precipitation, from 1865-2016.



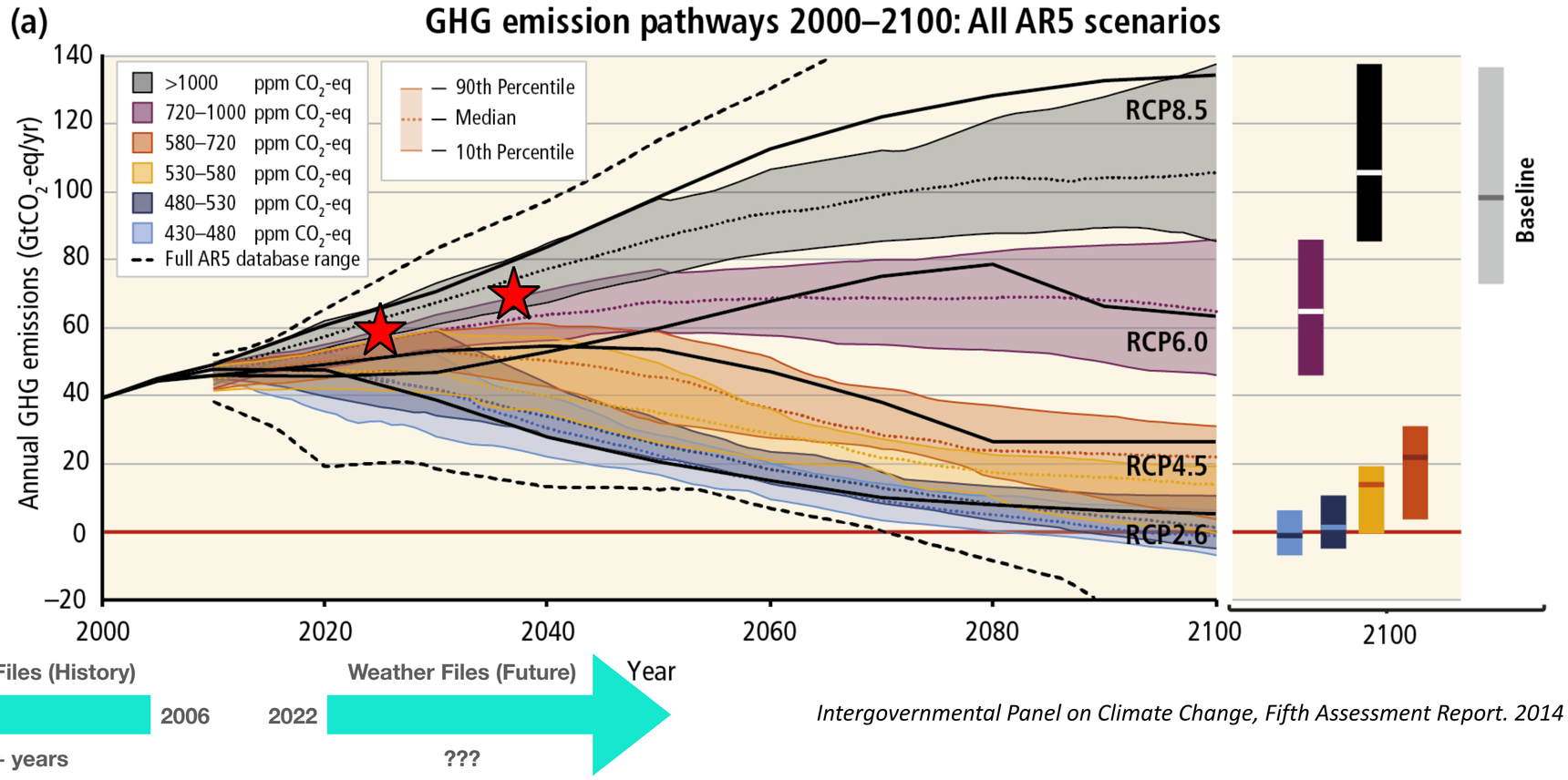
Between 1958 and 2012, the Midwest has already experienced a 37% increase in larger rain events of 2.5 inches or greater.

National Weather Service: https://www.weather.gov/wrh/Climate?wfo=mpx

Potential Future Weather Changes

https://metrocouncil.maps.arcgis.com/apps/webappviewer/index.html?id=100fa3012dcc4e288a74cbf4d95027bf

Potential Future Weather Changes



Intergovernmental Panel on Climate Change, Fifth Assessment Report. 2014

Potential Future Weather Changes

Strategy	Hours: Actual and Percentage					
	Now		2030		2040	
Comfort	942	11%	885	10%	936	11%
Sun Shading of Windows	586	7%	778	9%	817	9%
High Thermal Mass	154	2%	217	2%	240	3%
High Thermal Mass Night Flushed	154	2%	228	3%	256	3%
Direct Evaporative Cooling	109	1%	179	2%	198	2%
Two-Stage Evaporative Cooling	111	1%	192	2%	216	2%
Natural Ventilation Cooling	104	1%	162	2%	170	2%
Fan-Forced Ventilation Cooling	72	1%	104	1%	106	1%
Internal Heat Gain	1589	18%	1353	15%	1361	16%
Passive Solar Direct Gain Low Mass	899	10%	826	9%	796	9%
Passive Solar Direct Gain High Mass	624	7%	559	6%	539	6%
Wind Protection of Outdoor Spaces	259	3%	254	3%	249	3%
Humidification Only	0	0%	0	0%	0	0%
Dehumidification Only	491	6%	659	8%	692	8%
Cooling, add dehumidification if needed	305	3%	549	6%	604	7%
Heating, add humidification if needed	4791	55%	4545	52%	4436	51%

Predicted Effectiveness of Comfort Strategies for Minneapolis / Saint Paul – Climate Consultant, UCLA Energy Design Tools Group

Needed Research

- Apply new and emerging downscaled climate data to minnesota
- Model the impact of changing climate on energy efficiency and design
- Understand the impact of changing climate on site and water design to increase resilience
- Assess additional risks and impacts and develop the role infrastructure can play to reduce those impacts

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