Assessment of Impacts of Climate on New Mexico Water Resources over the Next 50 Years

A Foundation for the New Mexico 50 Year Water Plan

New Mexico Climate and Water Advisory Team

A collaboration between two state-funded agencies

New Mexico Bureau of Geology and Mineral Resources
New Mexico Tech
Earth Science for the 21st Century

Office of the State Engineer
nm
Interstate Stream Commission

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50 Year Water Plan New Mexico

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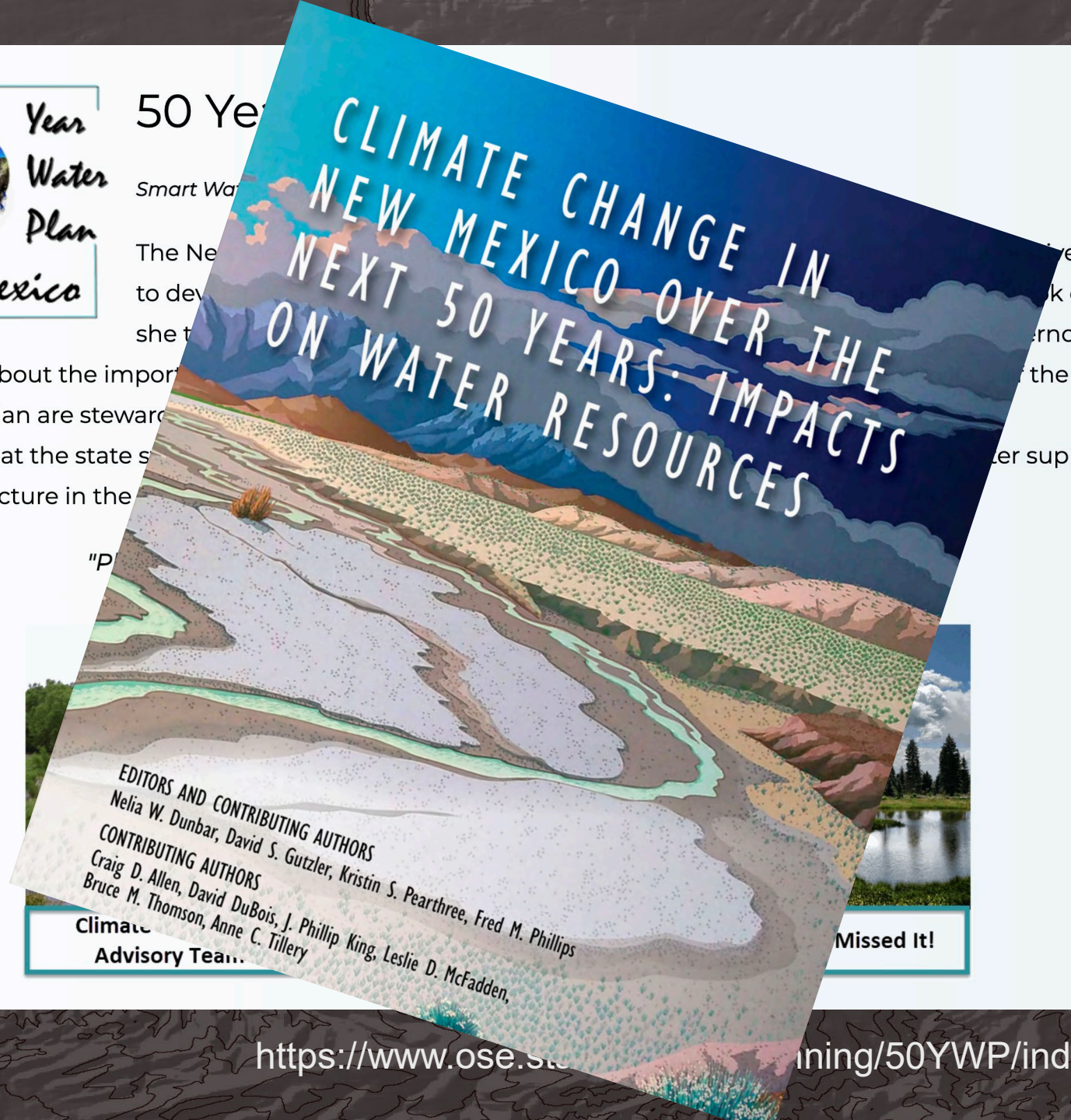

Missed It!

https://www.ose.st ning/50YWP/index.php

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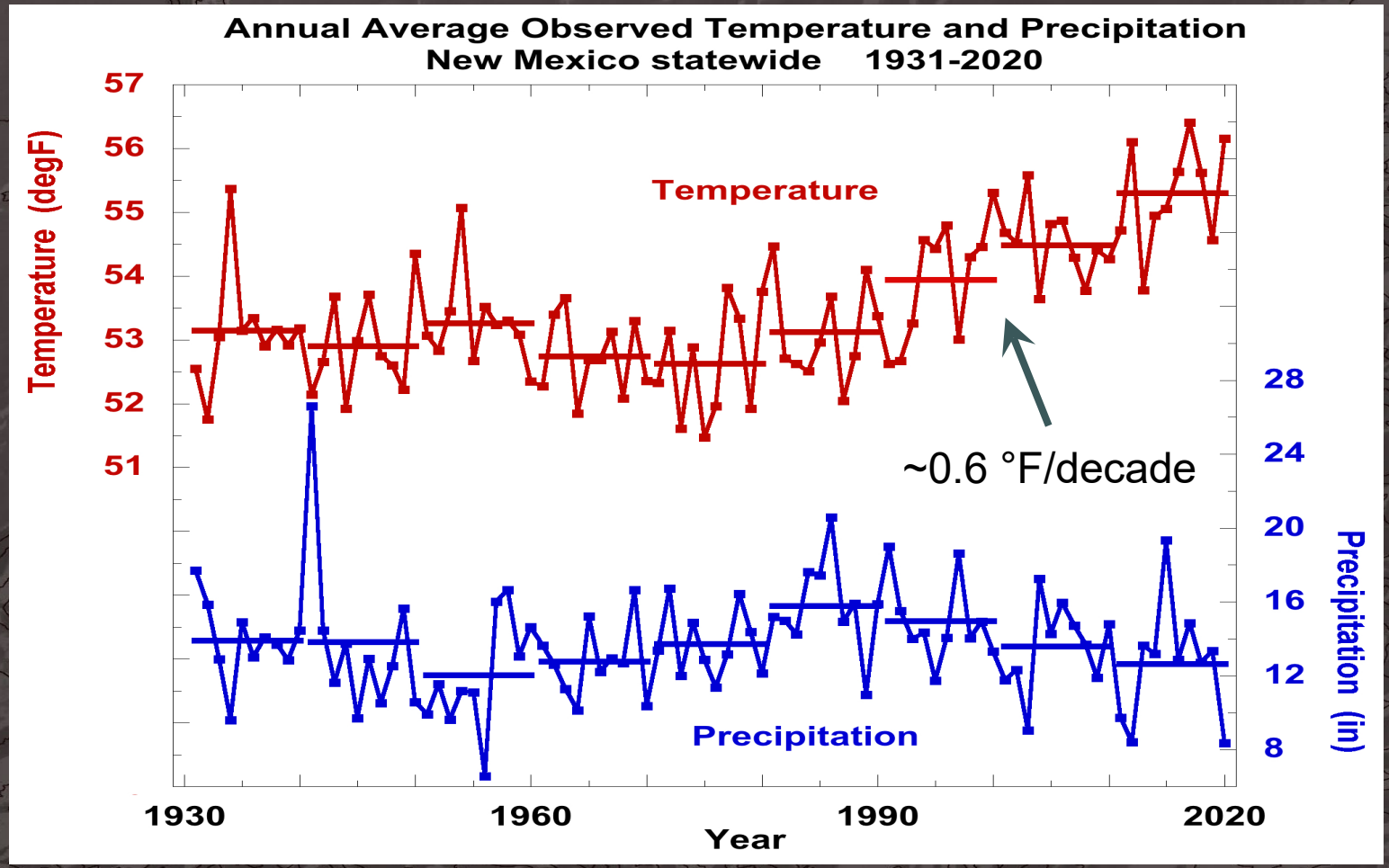
Why do we need this?

New Mexico's climate is warming

A new 50-year water plan for the state must account for ongoing and future changes to our climate and water resource reliability



Decade-average temperatures have been climbing steadily for the past 50 years

Precipitation has no clear trend but is hugely variable, annually and decadally.
4 of the 5 driest years since 1930 have occurred in the past two decades

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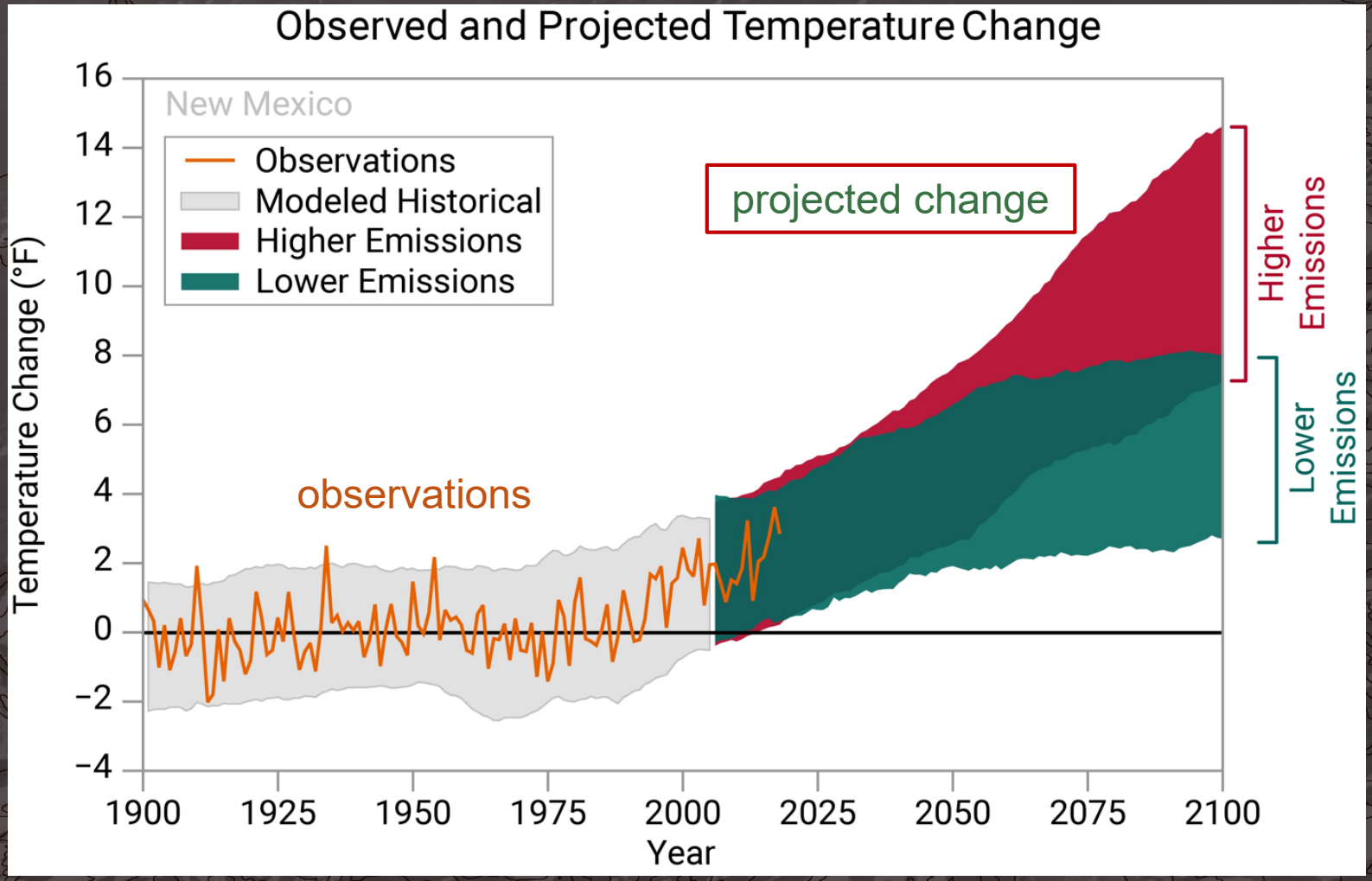
New Mexico's climate will continue to warm in response to increasing concentrations of atmospheric greenhouse gases



Red and **green** bands represent future temperature increases in NM projected by an ensemble of climate models, in response to **higher** or **lower** rates of future greenhouse gas emissions

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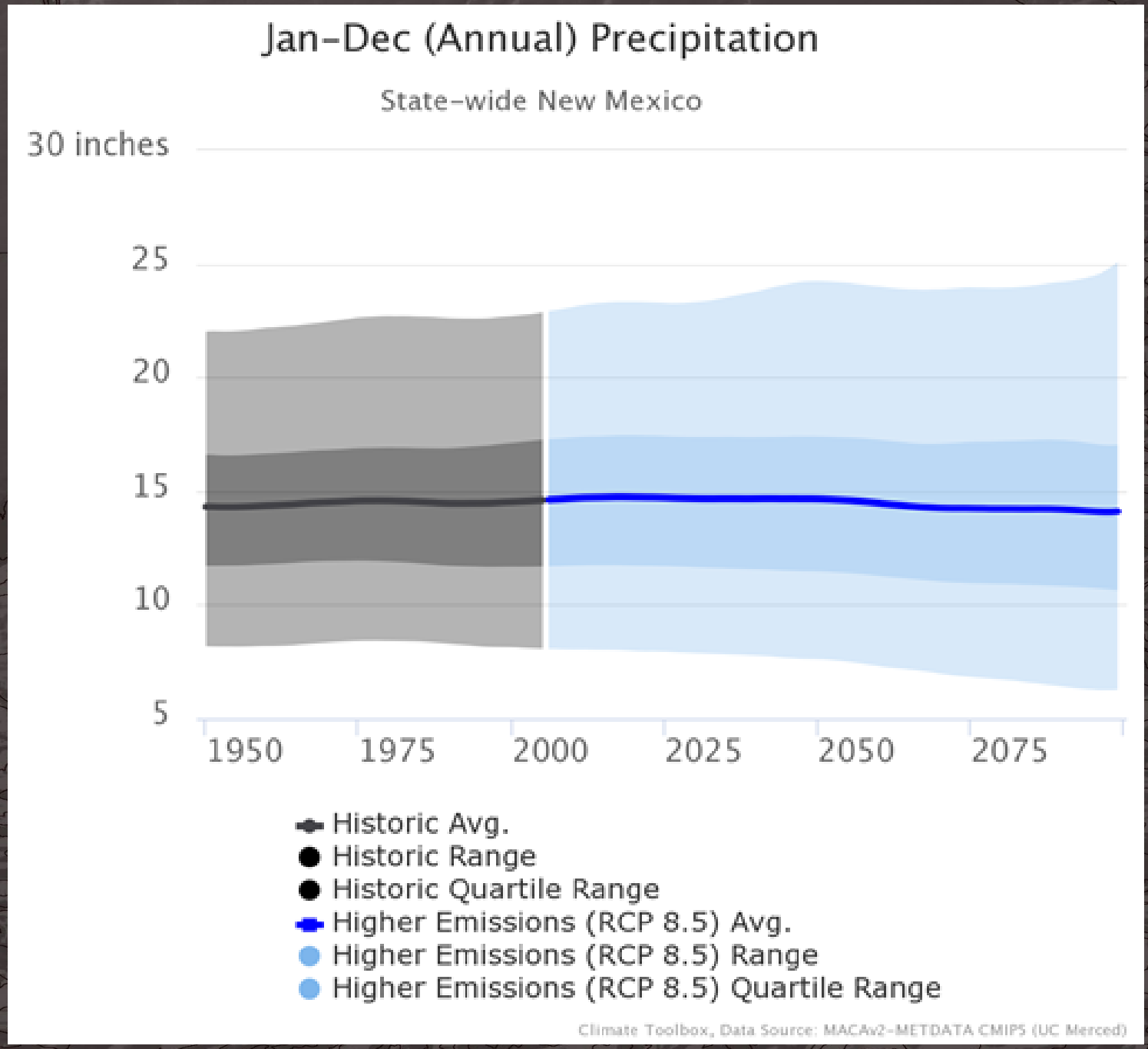
Average Precipitation



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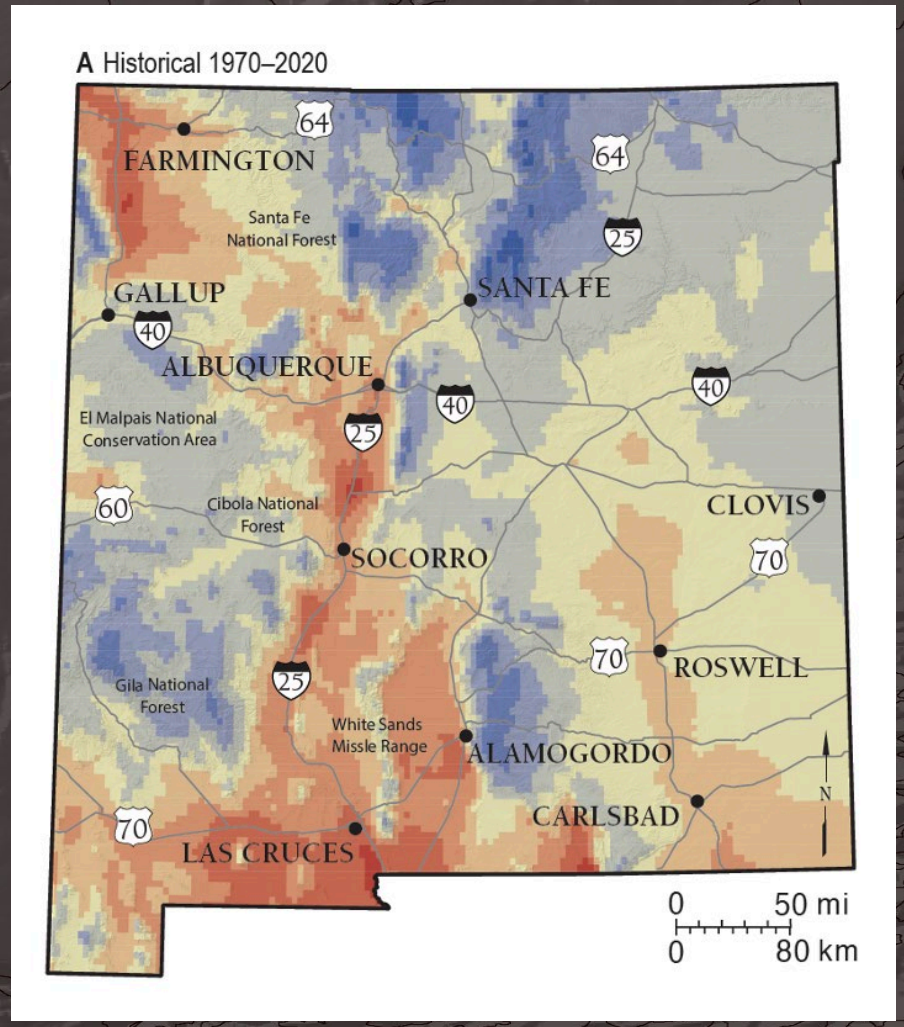
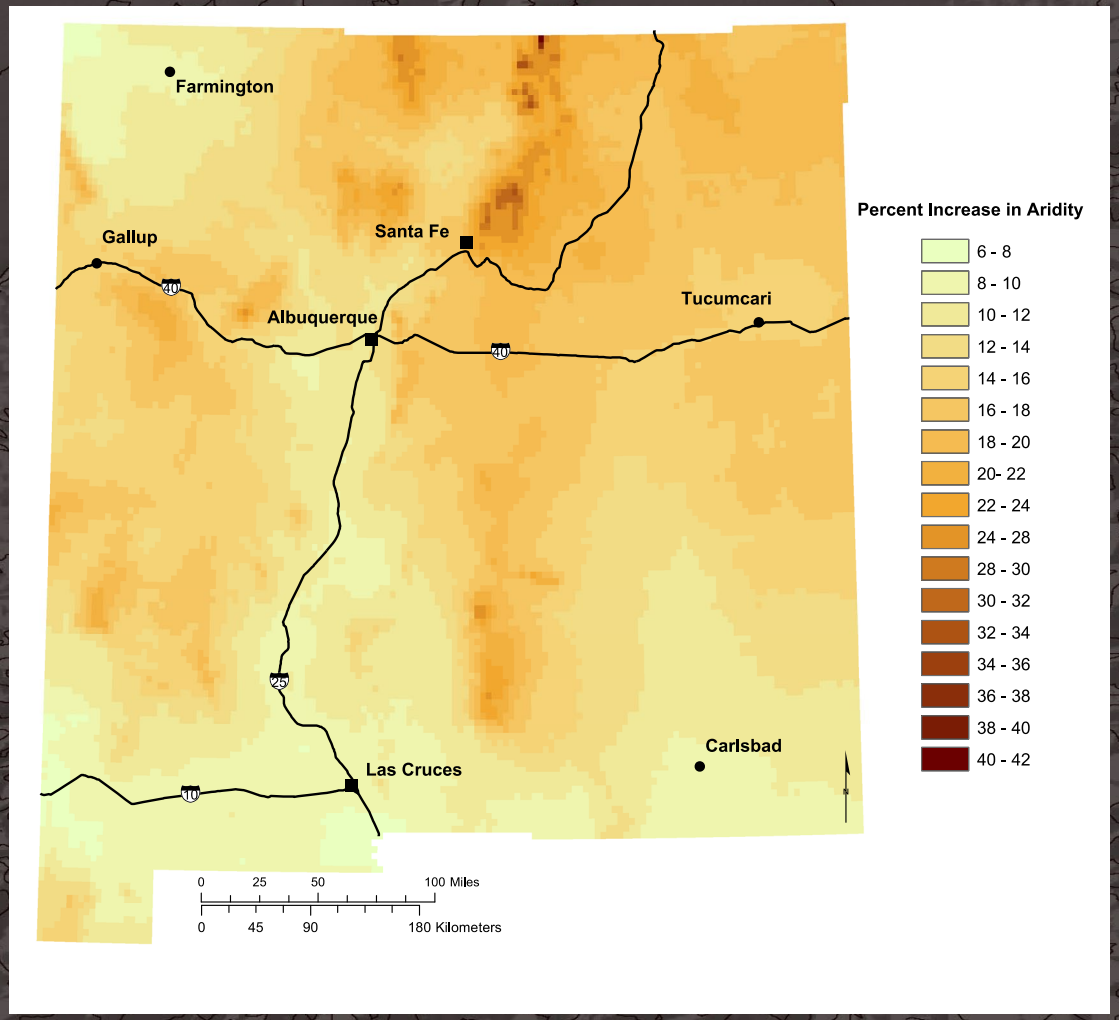
New Mexico will become more arid

Historical Aridity Index



Relative Aridity Index increase to 2055



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Snowpack and spring streamflow will decline

Different colored lines represent 3 individual simulations that show range of future projections

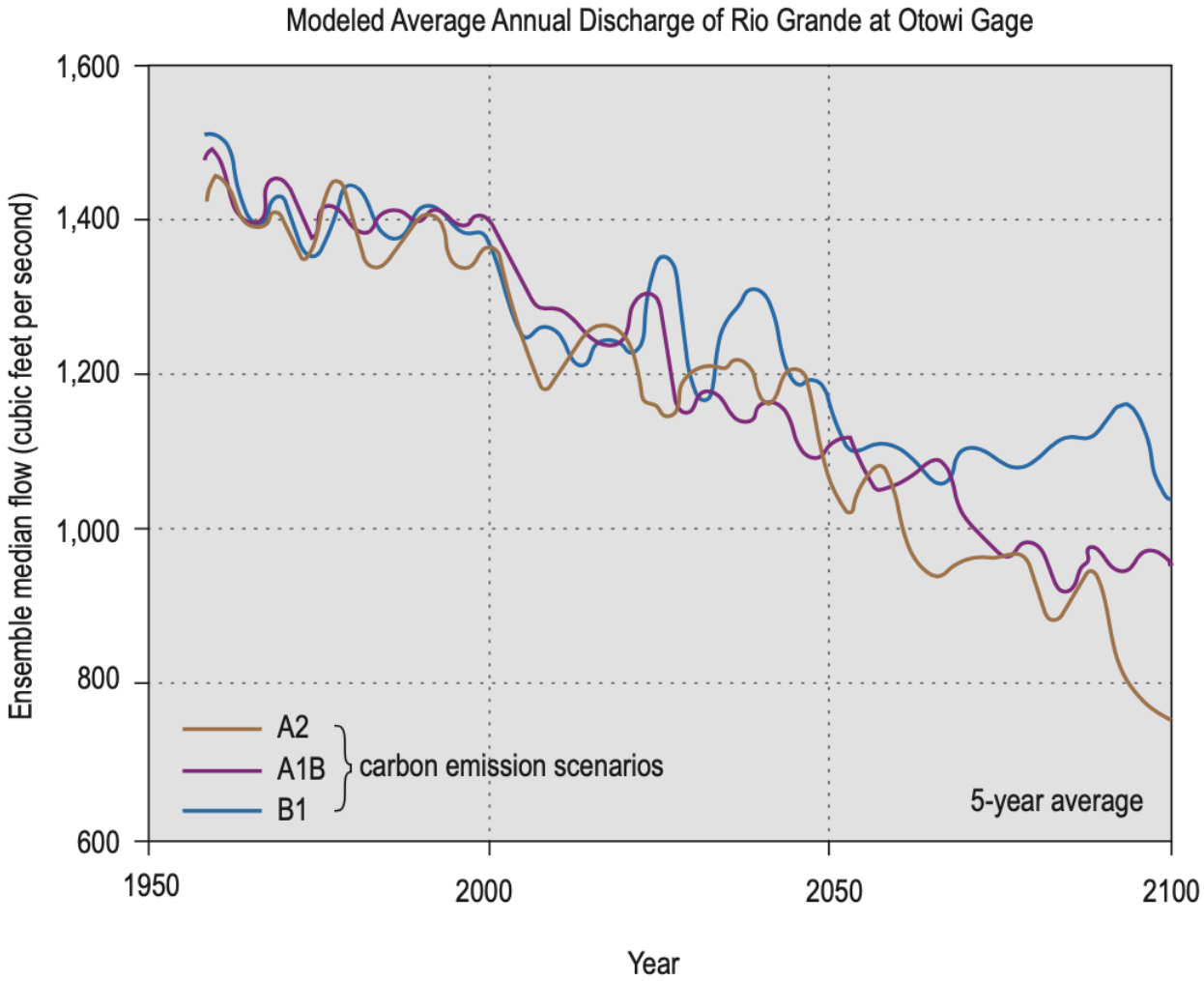

Figure 3.3. Modeled 5-year average discharge of the Rio Grande at the Otowi gage, in cubic feet per second, from 1950 to 2100 (Llewellyn and Vaddey, 2013). A2 represents high, A1B represents moderate, and B1 represents low carbon emission scenarios.

US Bureau of Reclamation study of the Rio Grande, 2013

Groundwater Recharge

- Difficult to model in our arid environment
- Models estimate declines, but high degrees of uncertainty
- Declines observed in water level in many New Mexico aquifers, but difficult to separate declining recharge from pumping effects
- Despite uncertainties in future projections of both recharge and runoff, indications are strongly toward less of both, largely due to increased evapotranspiration due to warmer air temperature. Decreases of 20% to 30% over the next fifty years are plausible, if not demonstrable.

Ecological Dynamics, Landscape Change and Soils

Jemez Mountains after Las Conchas fire, 2011

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Ecological Dynamics, Landscape Change and Soils

Effect of Heat Stress on Rangeland Combustibility

Black Fire, 2022

Ecological Dynamics, Landscape Change and Soils

- Hotter, drier conditions stress vegetation
- Additional tree mortality, moved forward by disease and insects

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Increased incidence of catastrophic wildfires, may lead to landscape change, which can make plant recolonization challenging

Las Conchas fire 2011

Santa Clara Canyon in 2015

Permanent conversion of ponderosa pine forest to shrub land/bare rock

Landscape Changes

- Changes in climate result in landscape changes, accelerated by wildfire effects

Take-home summary

In 50 years:

- New Mexico will certainly get much warmer (at 7°F warmer, Albuquerque will be like Las Cruces and Las Cruces like Phoenix)
- Water demand for agriculture and landscaping will increase greatly (30 to 50%)
- Surface-water supply will decline by 25 to 50%

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Take-home summary

In 50 years:

- Water for ecosystems (e.g., riparian forest) will become scarce
- Weather will become more extreme, with high likelihood of long droughts being interrupted by unprecedented floods
- Desert landscapes will stay much the same, but mountains will lose most of their forests, being replaced by scrub vegetation and rocky barrens
- Frequent fires will be followed by damaging debris flows

Take-home summary

Some serious planning on how to deal with all of this would certainly be a good idea.