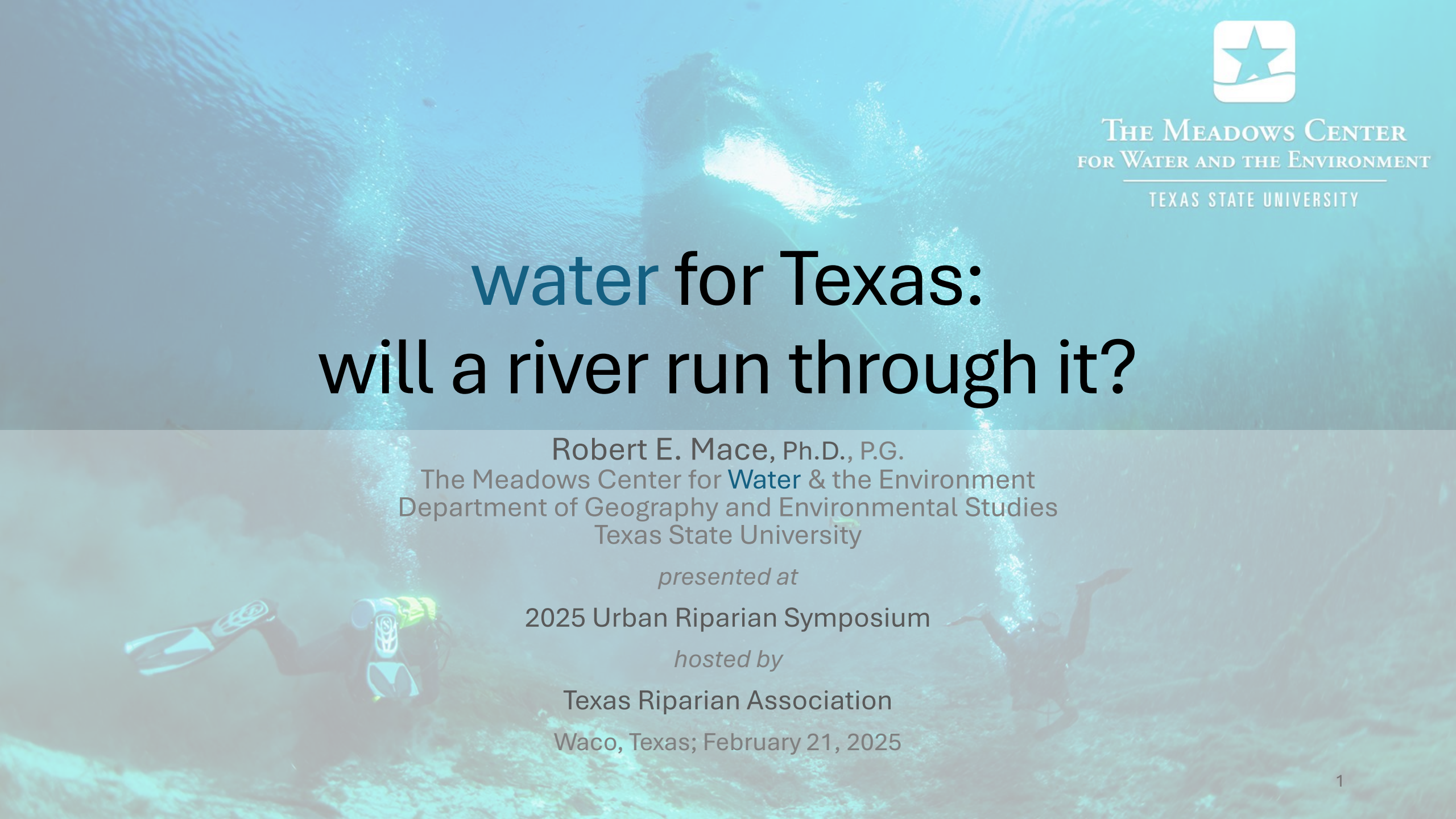

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Texas State University

water for Texas: will a river run through it?

Robert E. Mace, Ph.D., P.G.
The Meadows Center for Water & the Environment
Department of Geography and Environmental Studies
Texas State University

presented at

2025 Urban Riparian Symposium

hosted by

Texas Riparian Association

Waco, Texas; February 21, 2025

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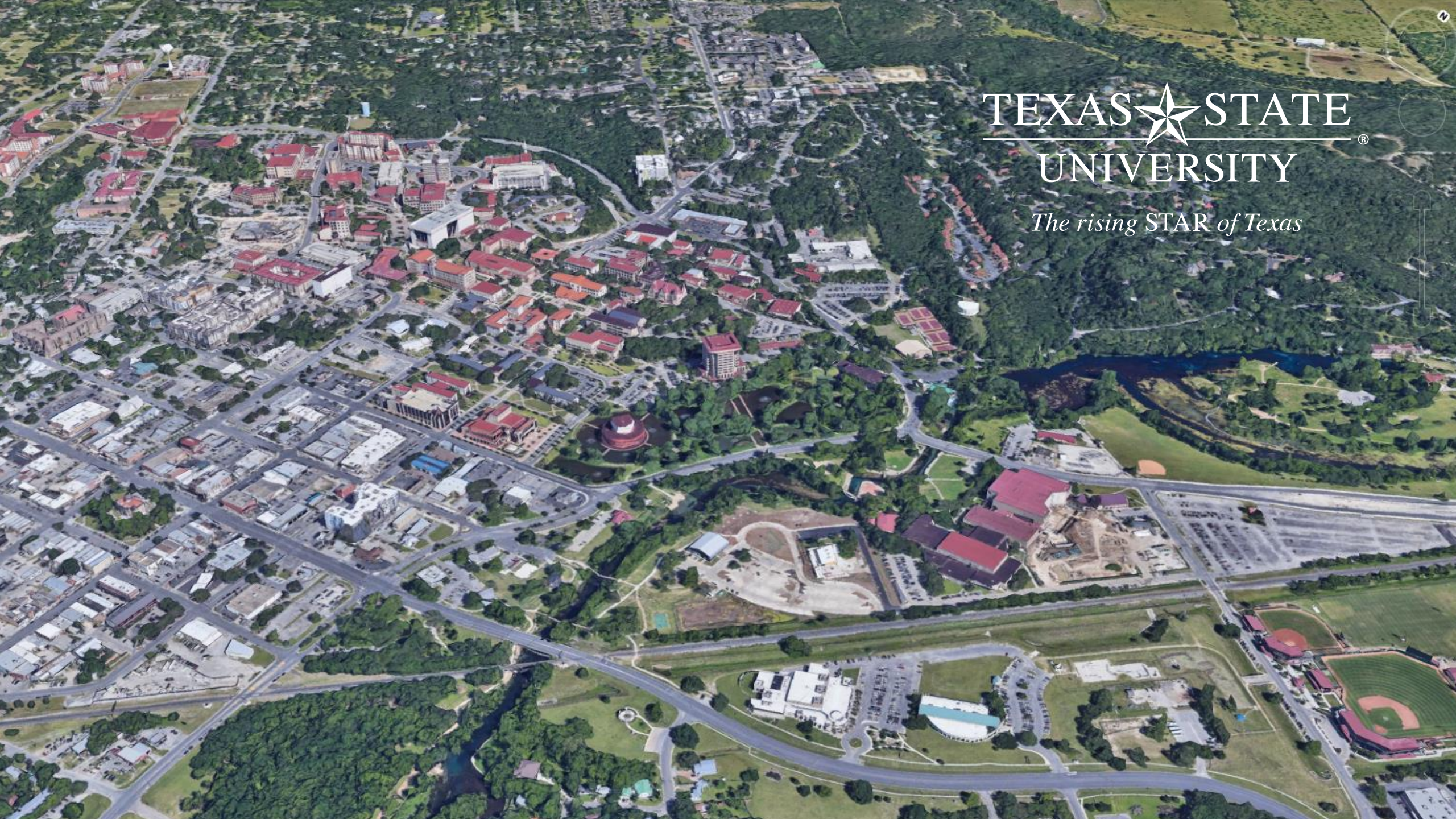
FOR WATER AND THE ENVIRONMENT
TEXAS STATE UNIVERSITY

- research institute (~$5 million budget)
- education facility (>140,000 guests, employ ~120 students)
- gifts, grants, and graces (93% of funding)
- stewards of the headwaters (a river runs through it…)

annual numbers (2024)
graces = services


TEXAS STATE
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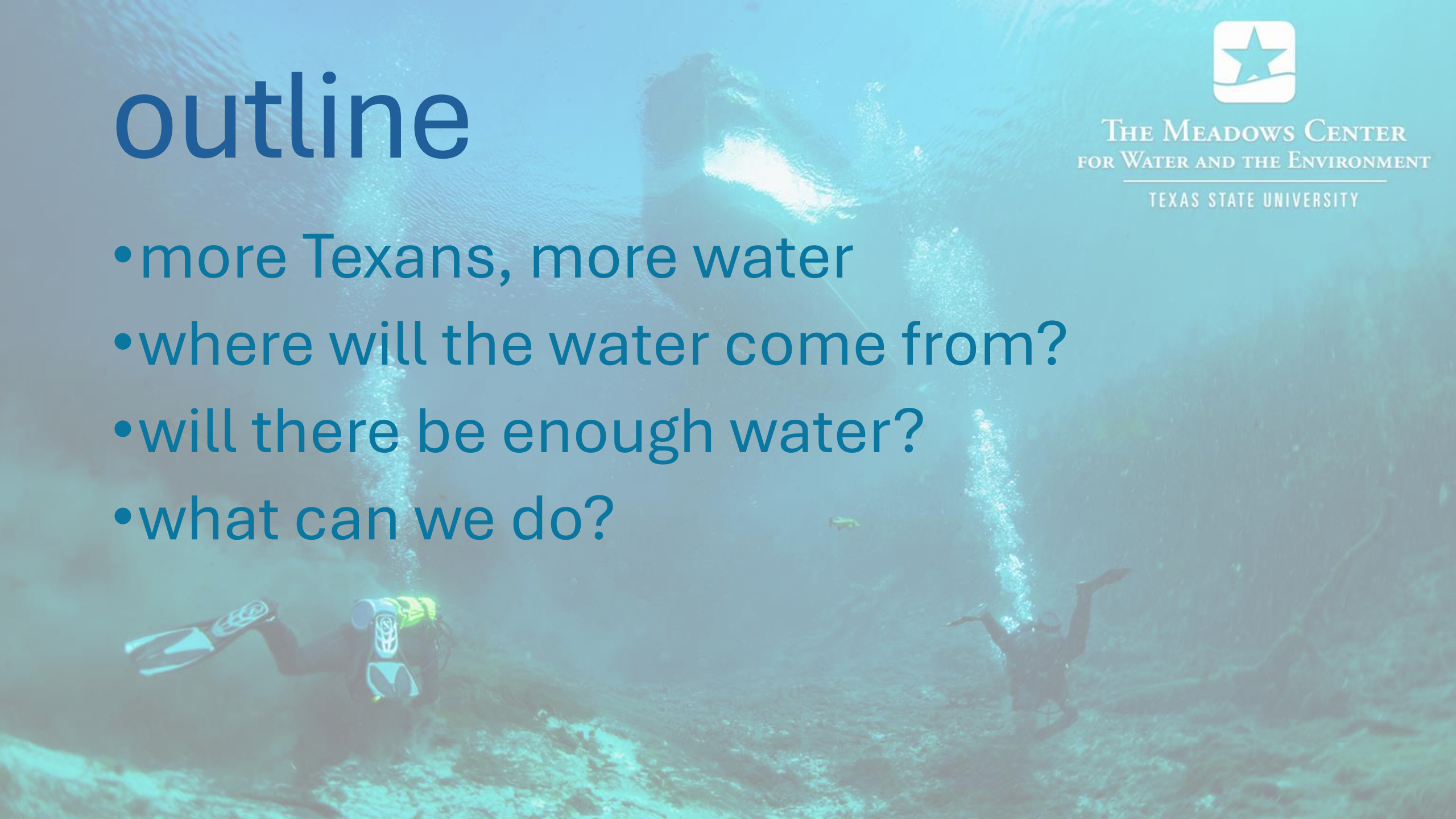
The rising STAR of Texas

outline

- more Texans, more water
- where will the water come from?
- will there be enough water?
- what can we do?



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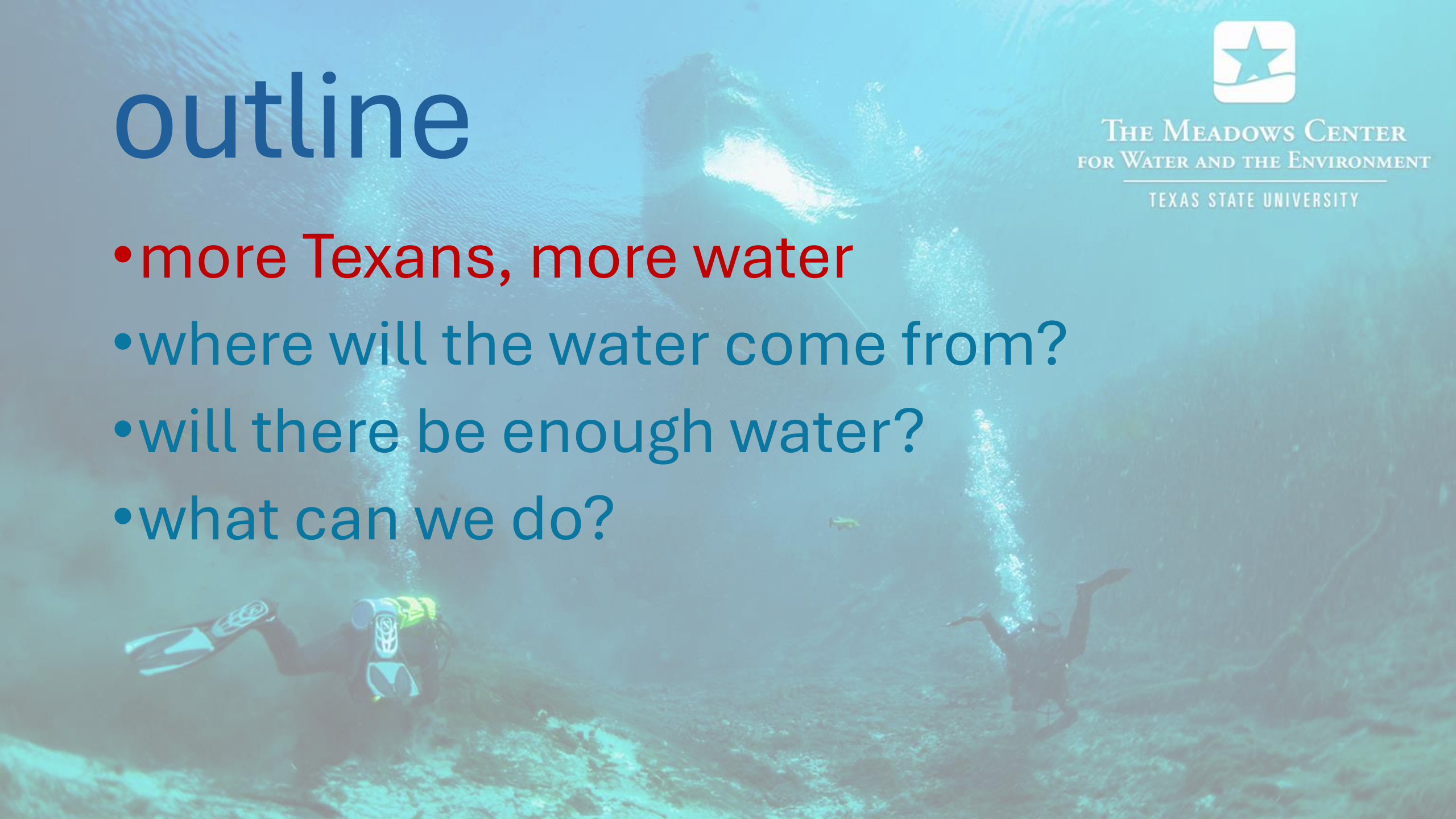

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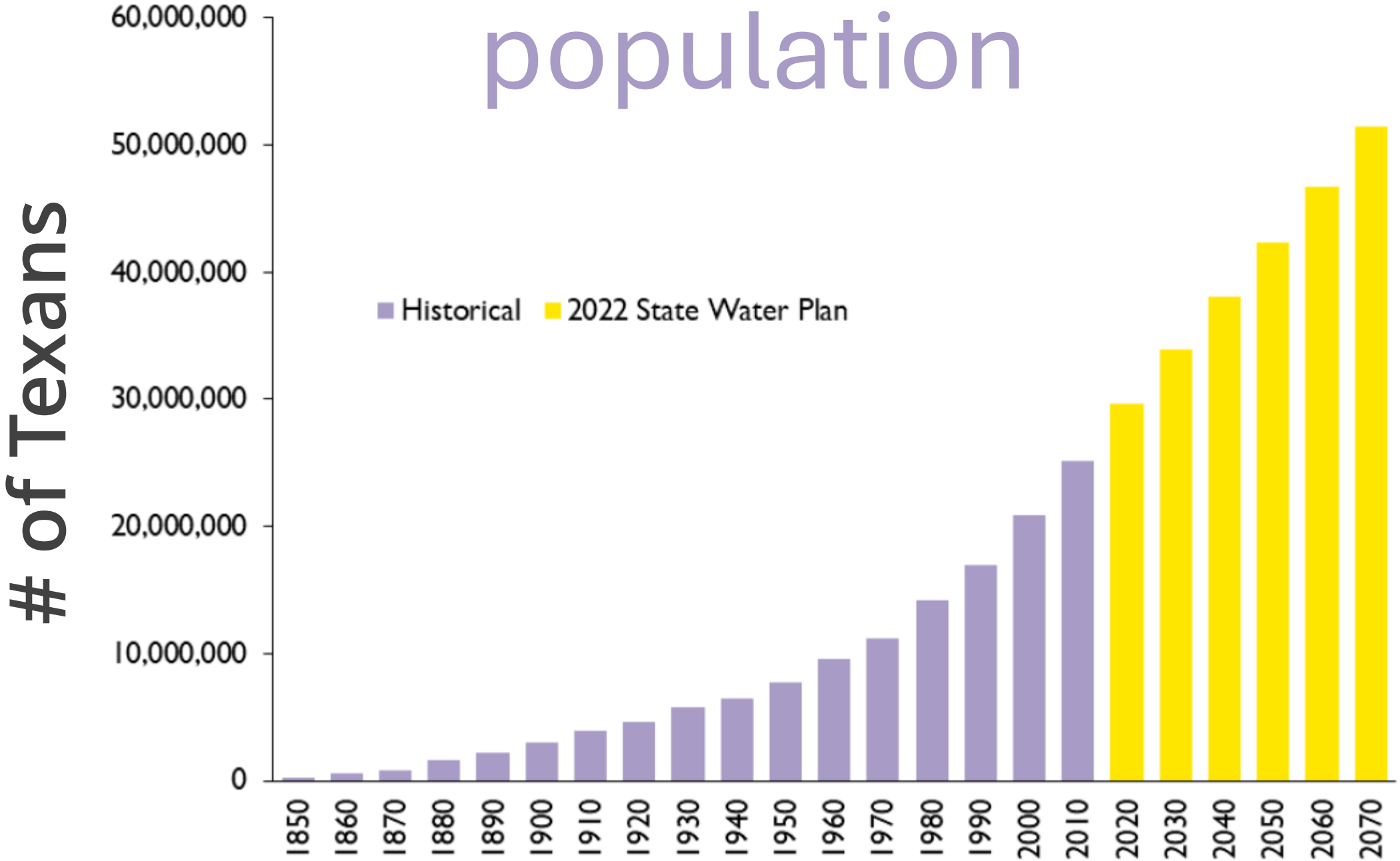
population



73% projected increase

2022 State Water Plan

acre-foot

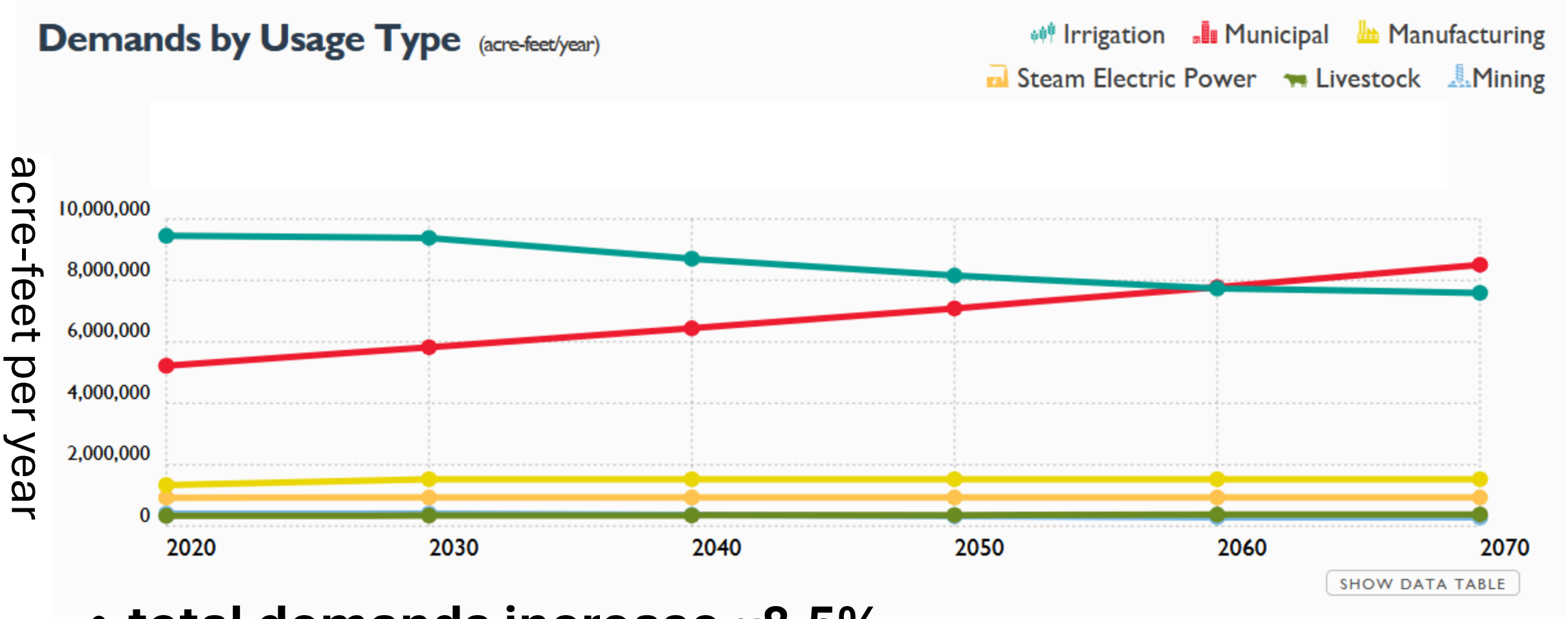
325,851 gallons

enough water for a year
for 10 average Texans

about a foot of water
on a football field

image: ChatGPT

Projected statewide water demands

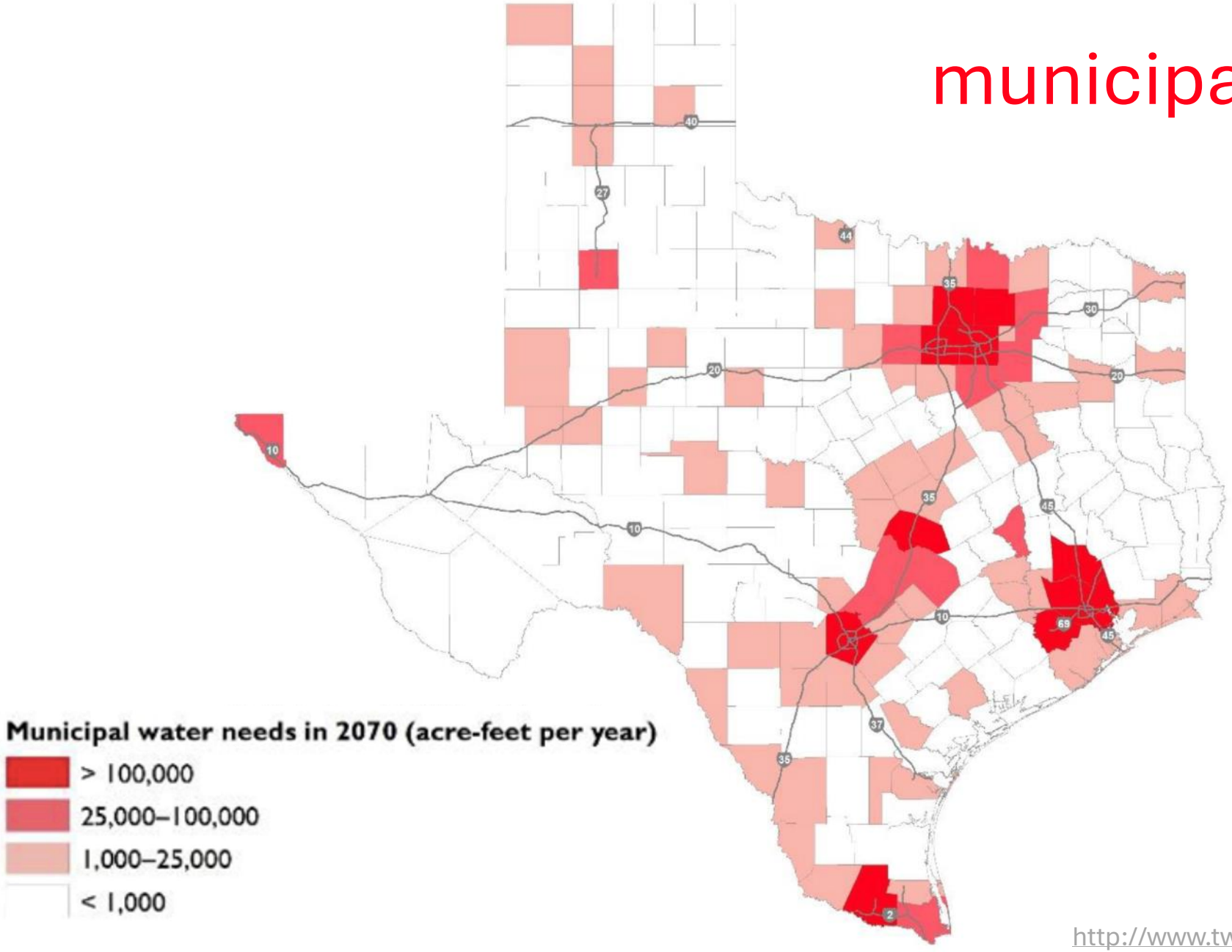


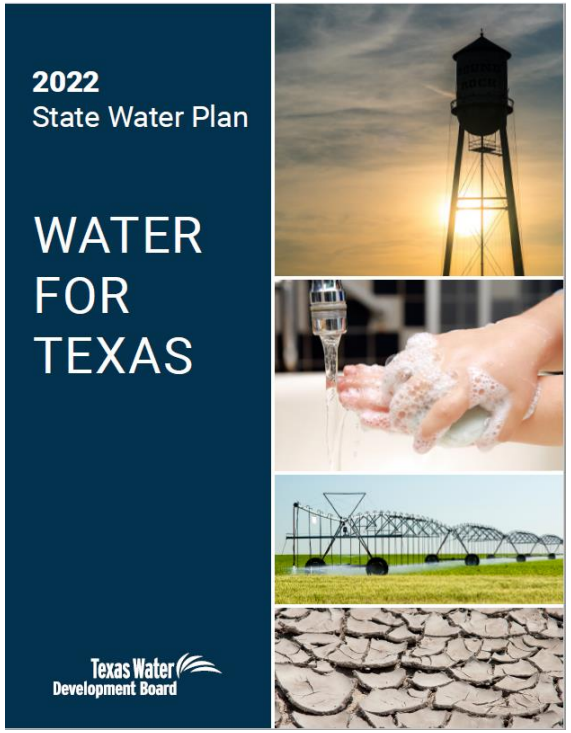
- **total demands increase ~8.5%**
- **municipal demands increase 63%**

Interactive State Water Plan

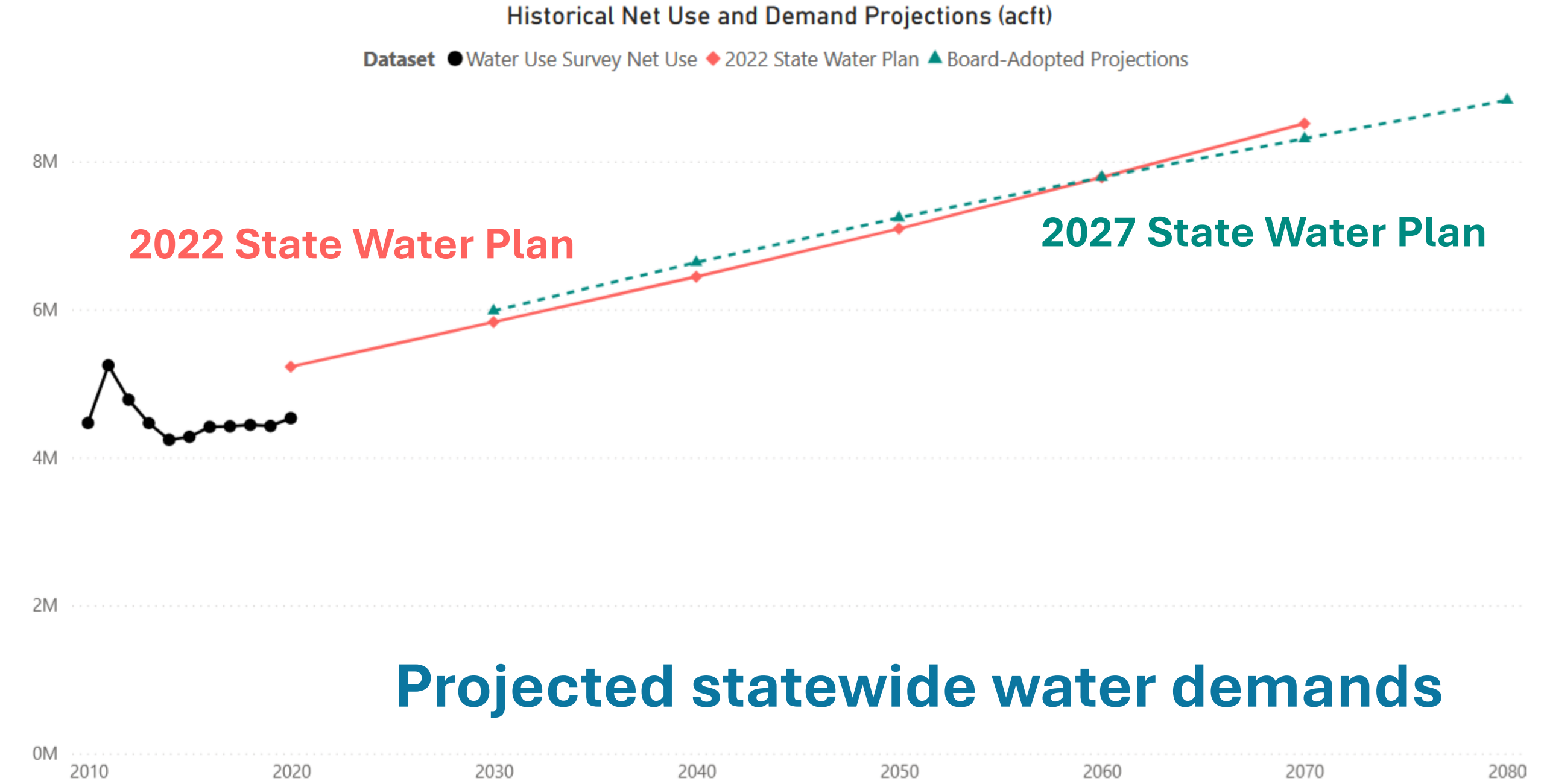
municipal water needs

Figure 6-2. Projected municipal water needs by county in 2070



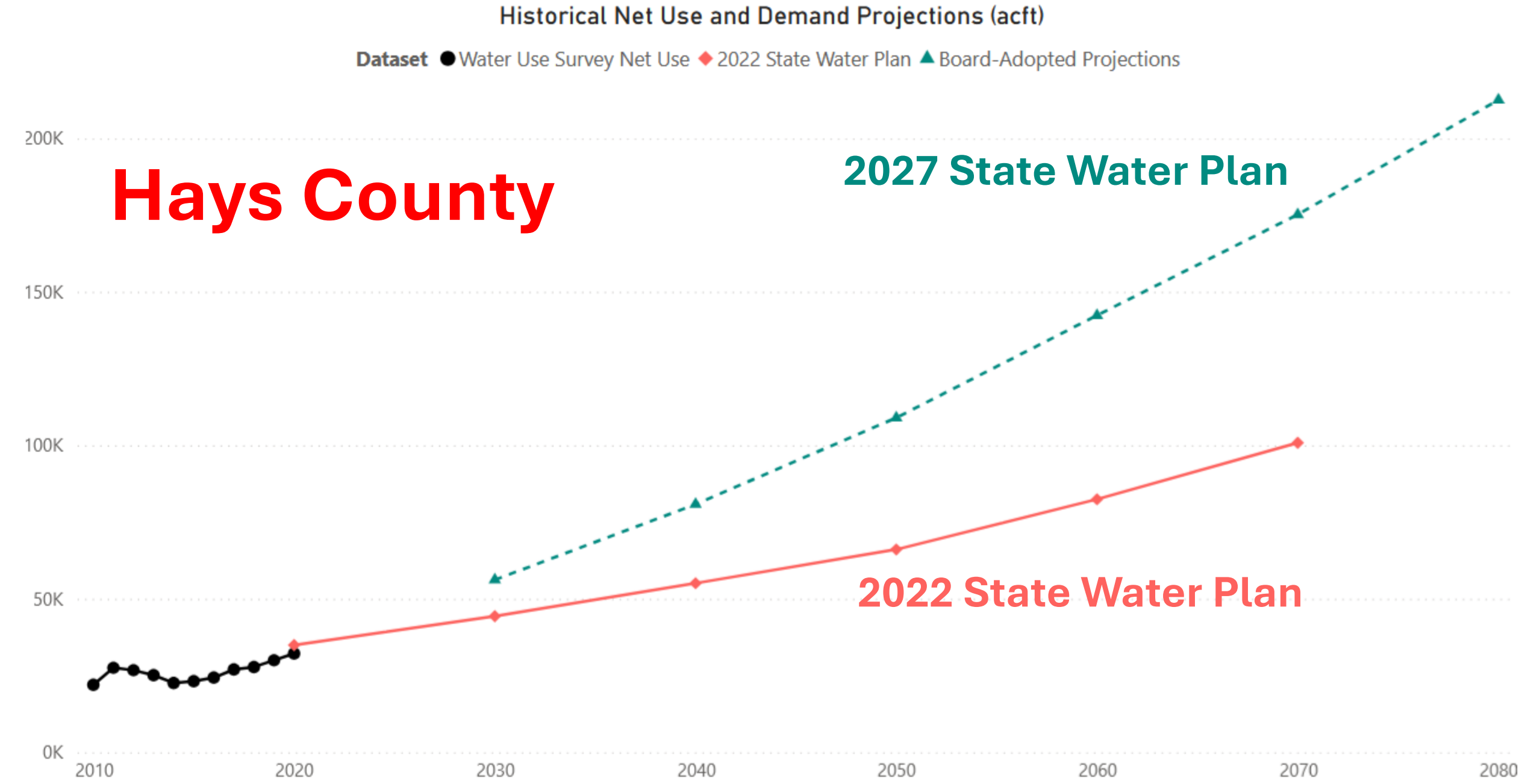


http://www.twdb.texas.gov/waterplanning/swp/2022/index.asp

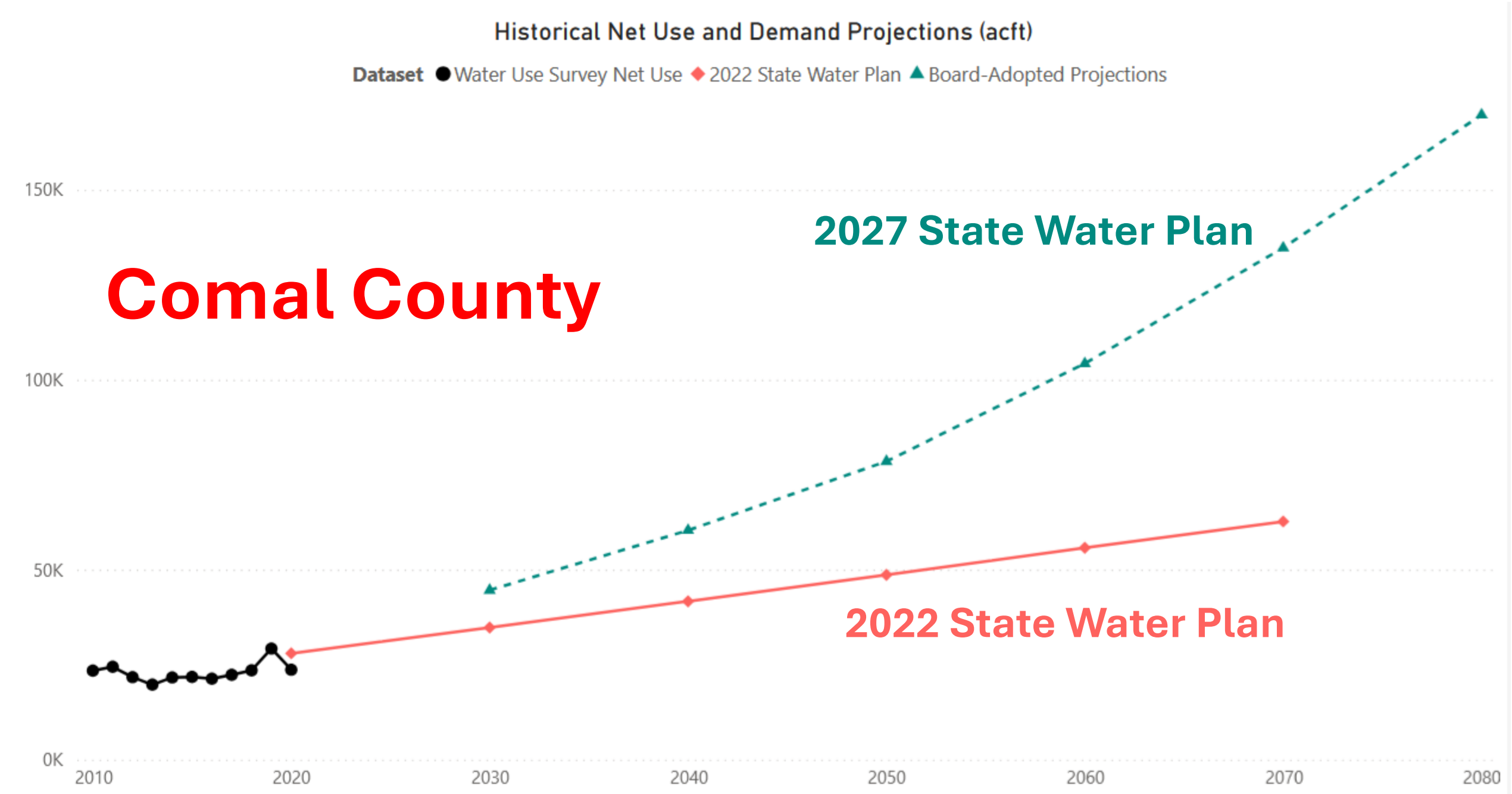


Projected statewide water demands

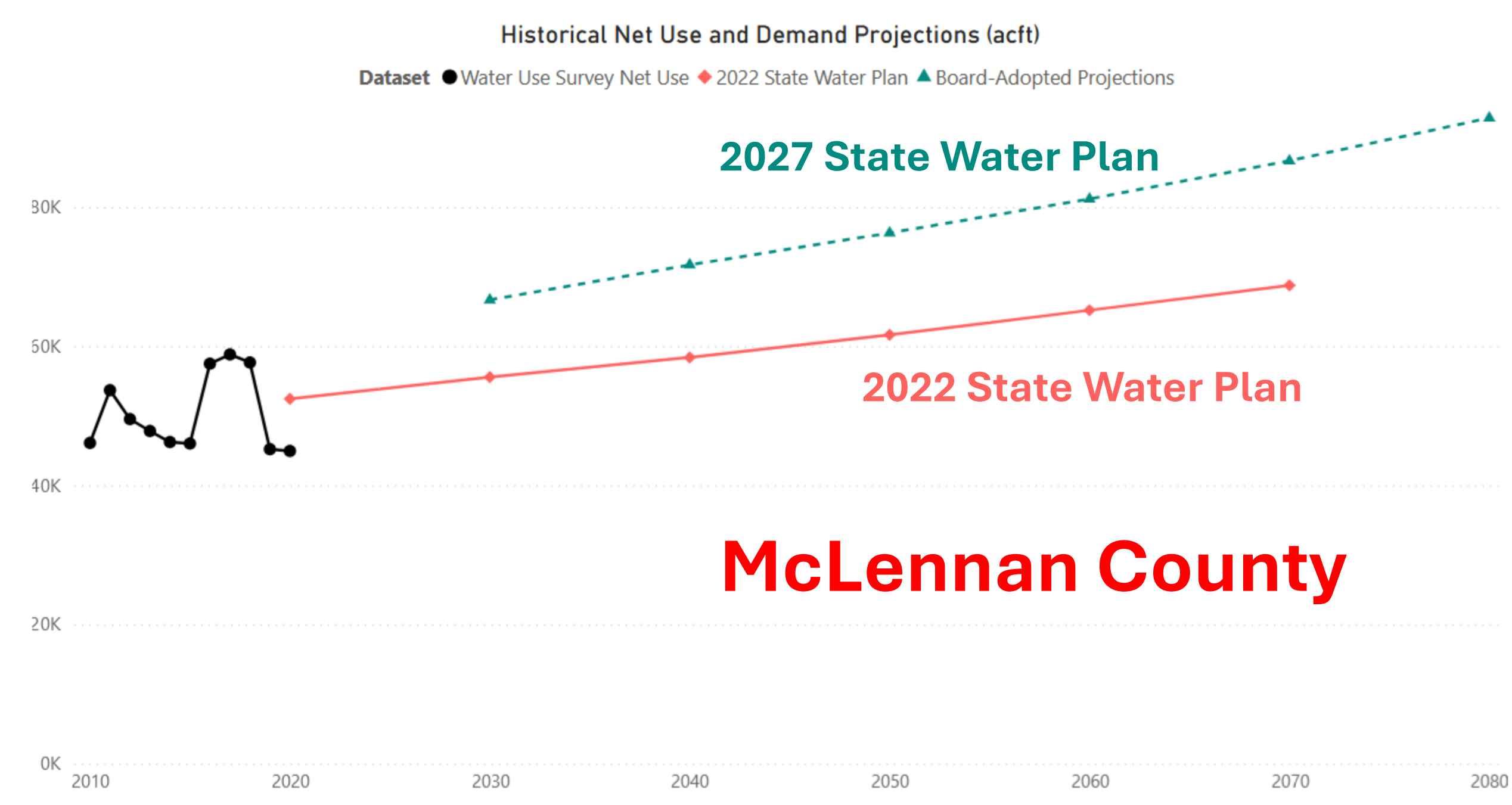
2026 Regional Water Plan Board-Adopted Population and Municipal Demand Projections



2026 Regional Water Plan Board-Adopted Population and Municipal Demand Projections



2026 Regional Water Plan Board-Adopted Population and Municipal Demand Projections



2026 Regional Water Plan Board-Adopted Population and Municipal Demand Projections

outline

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- where will the water come from?
- will there be enough water?
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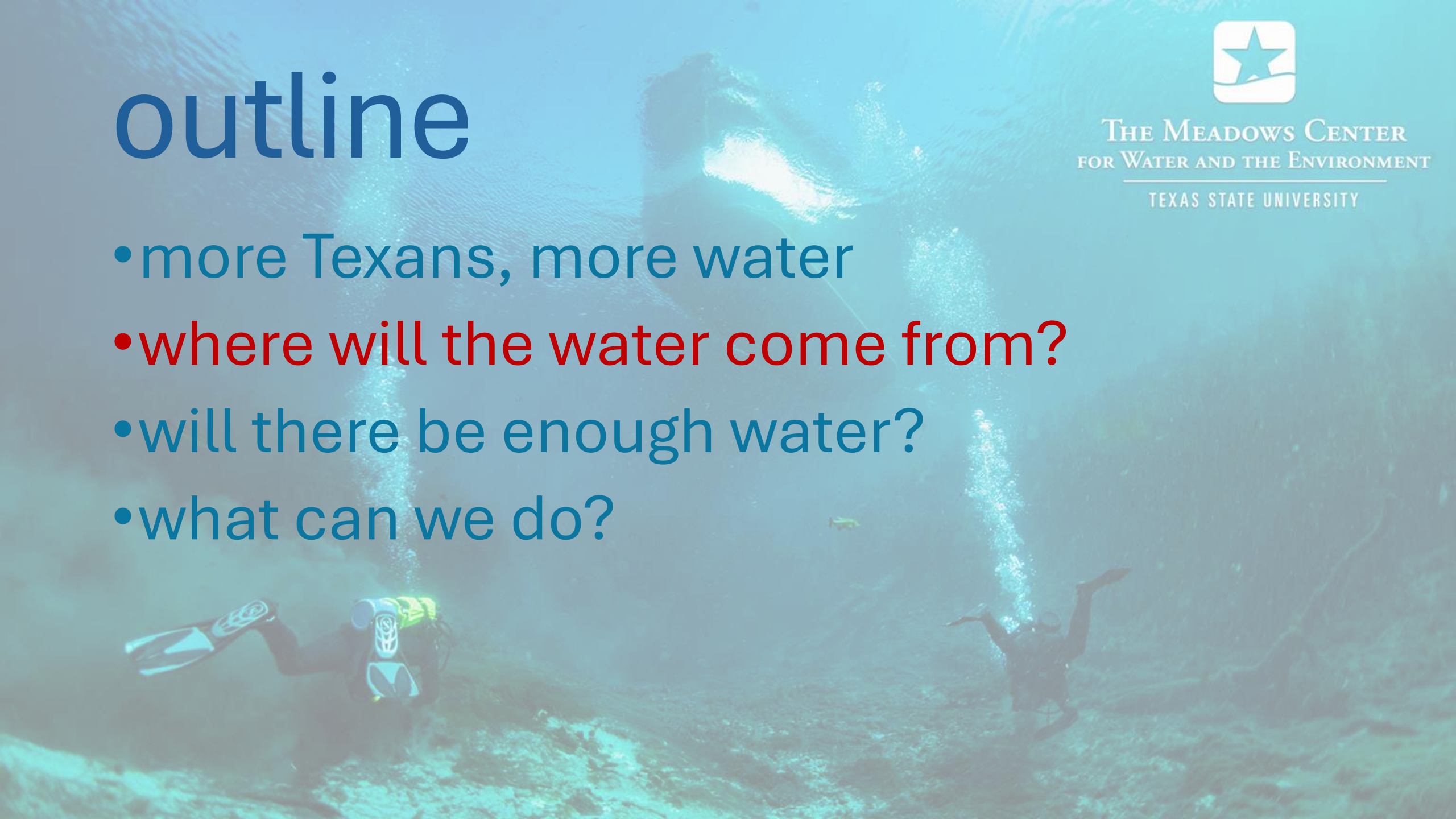

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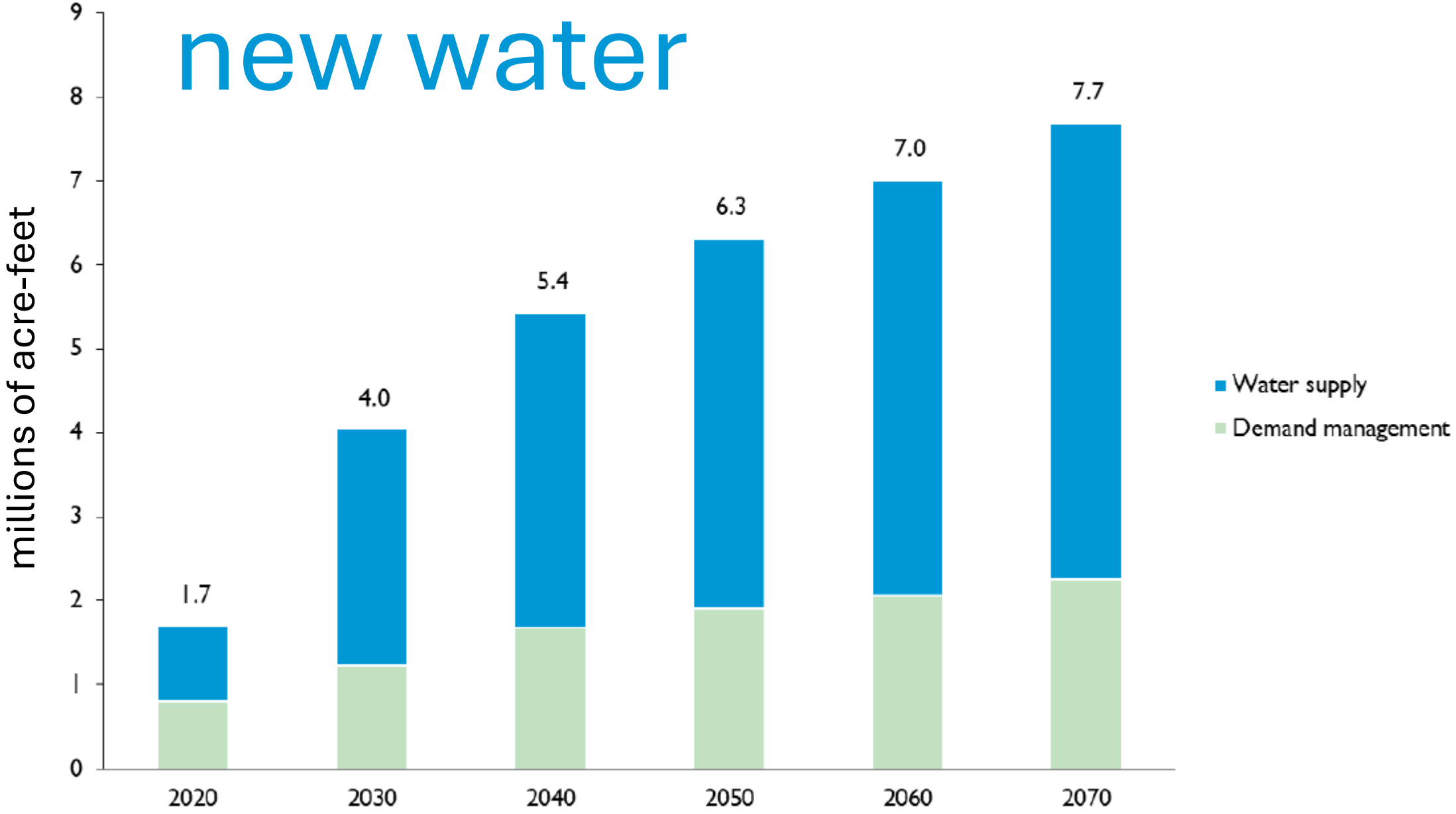
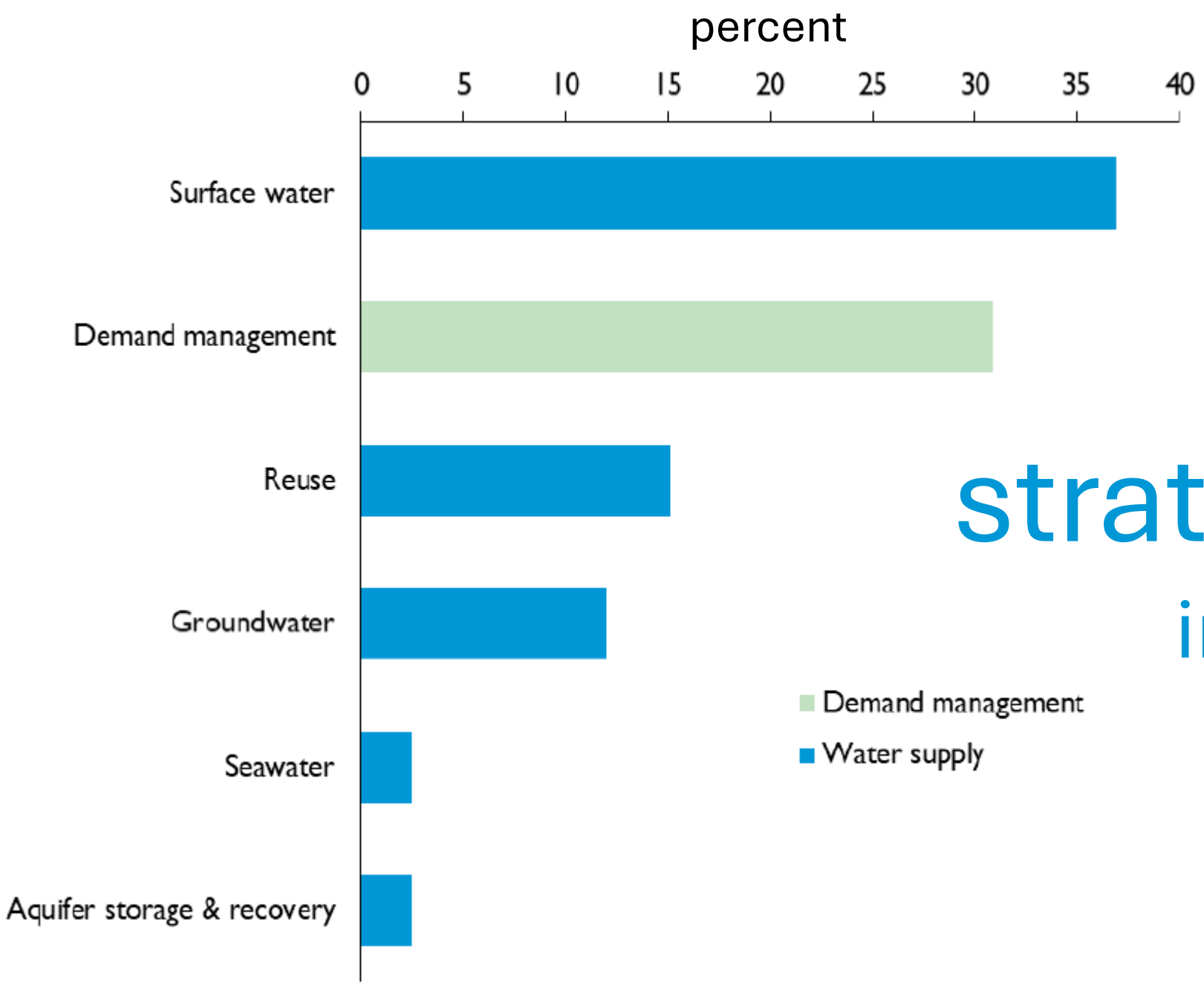
new water



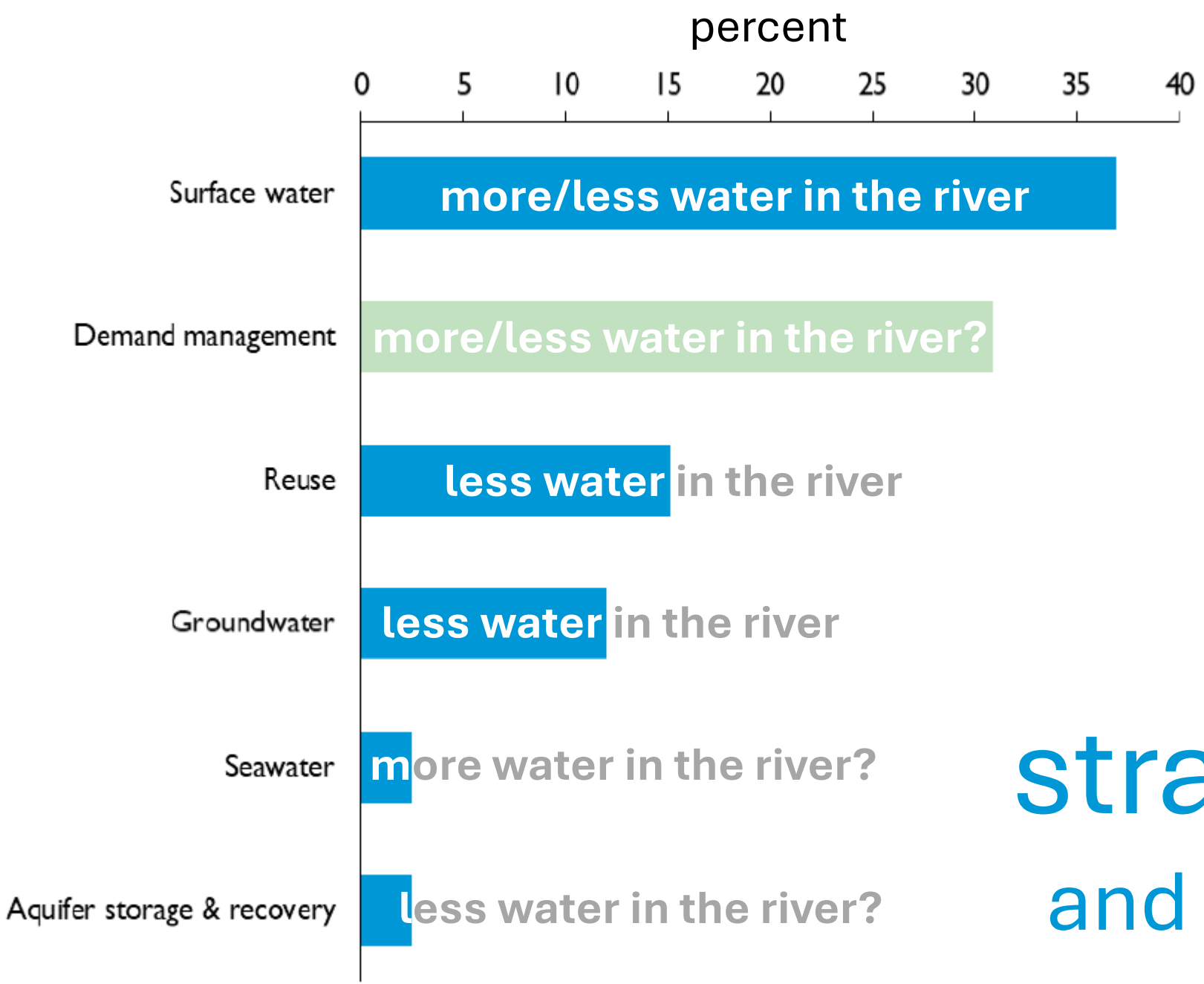
http://www.twdb.texas.gov/waterplanning/swp/2022/index.asp



strategy type

in 2070

http://www.twdb.texas.gov/waterplanning/swp/2022/index.asp



strategy type

and river impacts

modified after http://www.twdb.texas.gov/waterplanning/swp/2022/index.asp

outline

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- will there be enough water?
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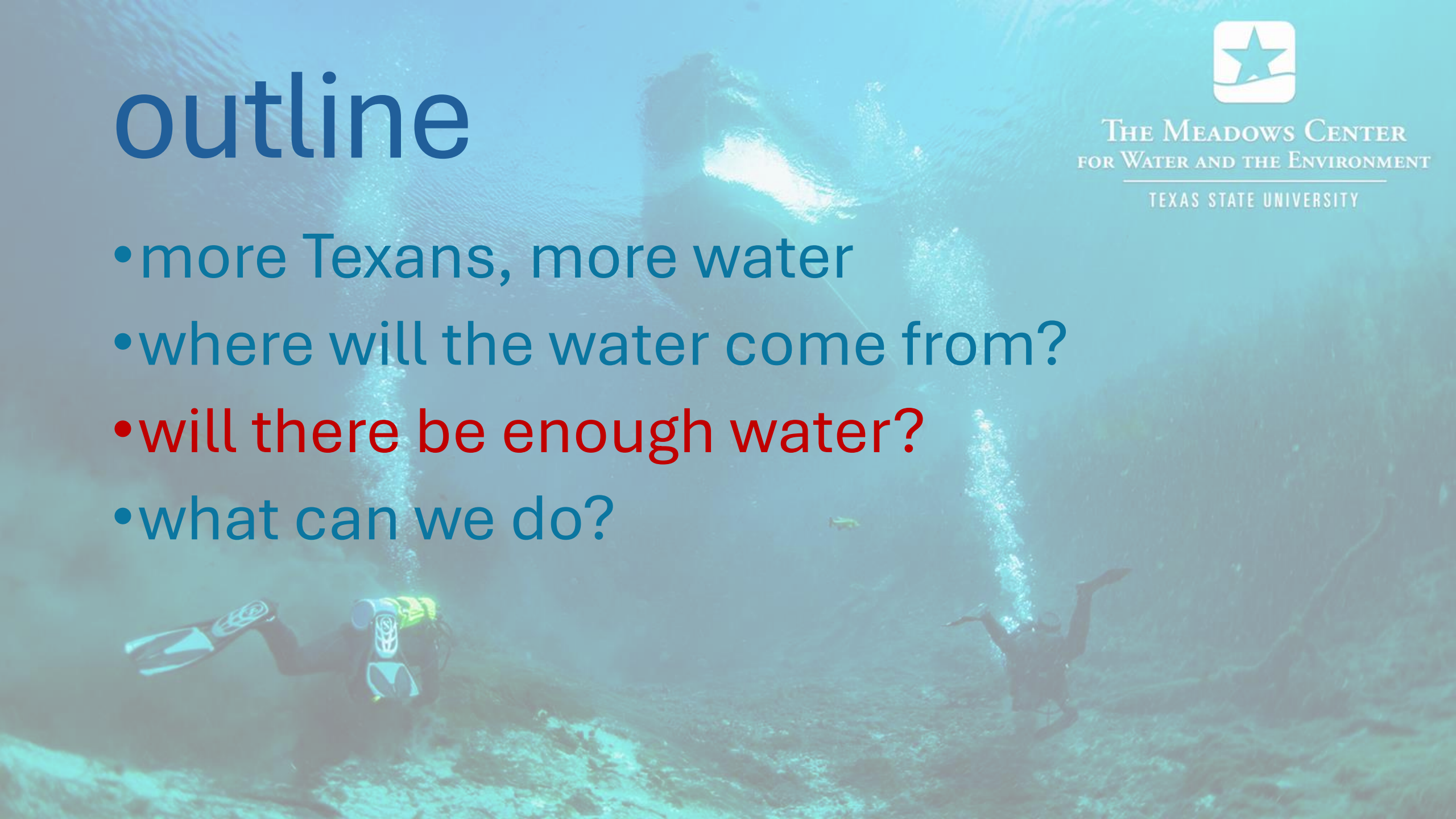

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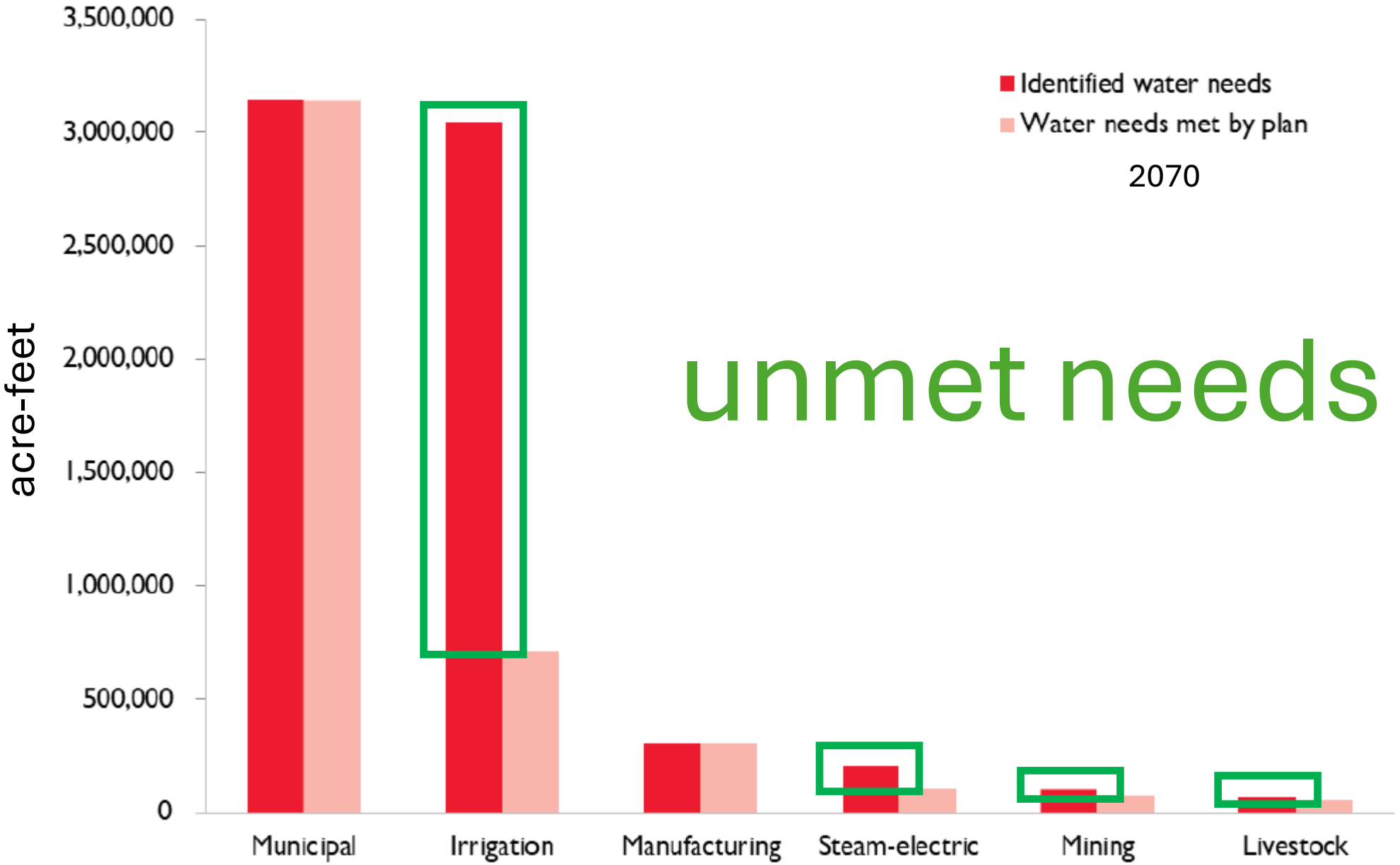

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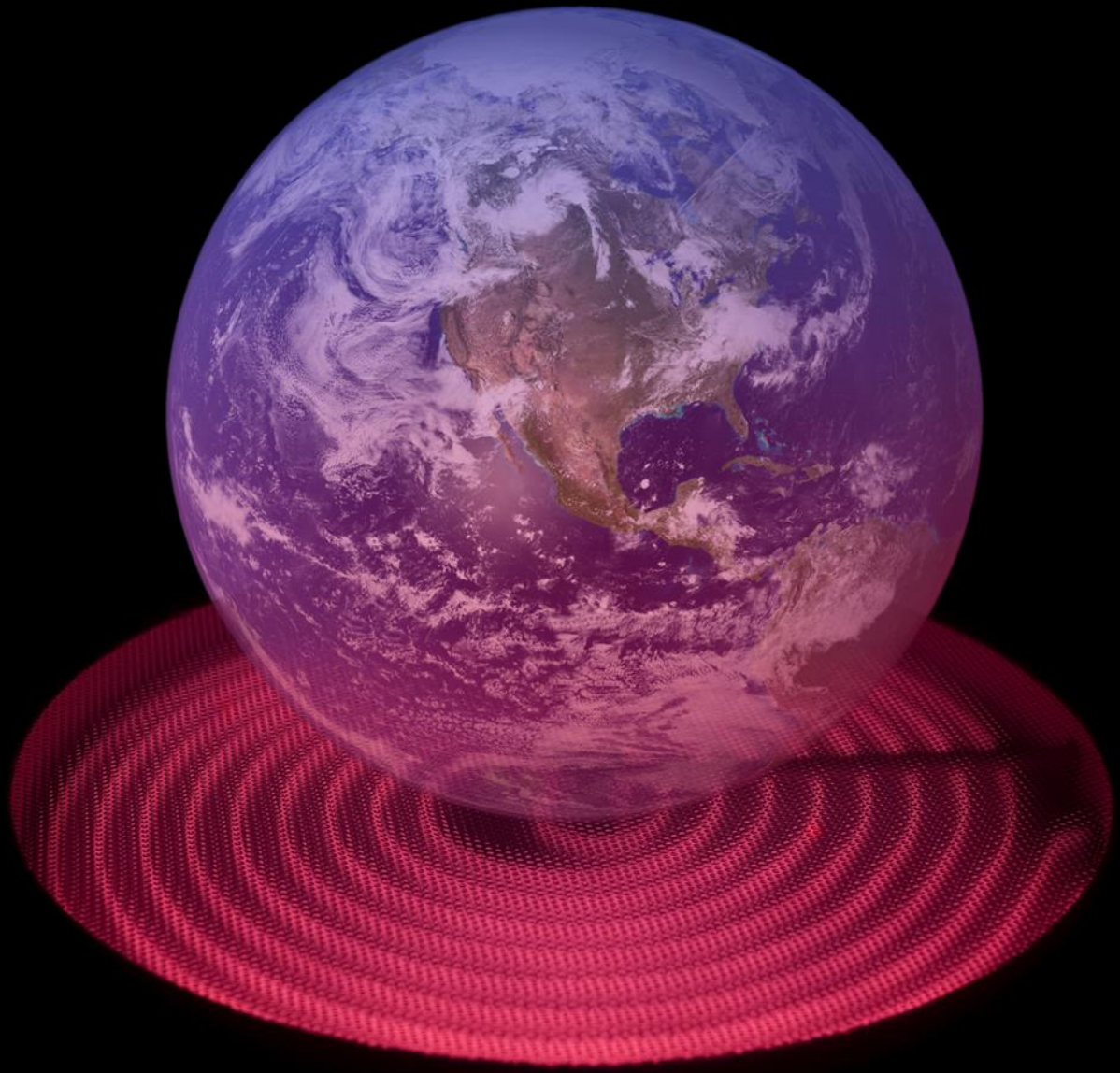
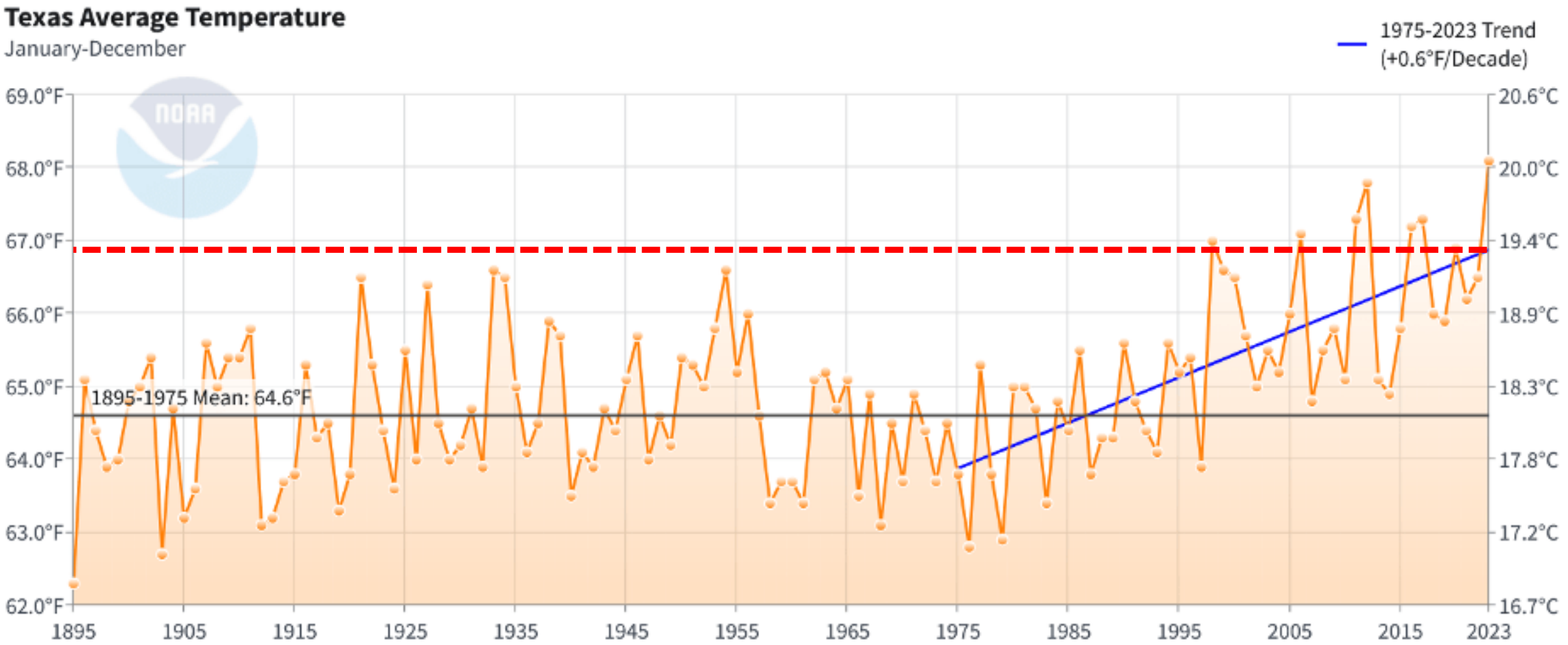
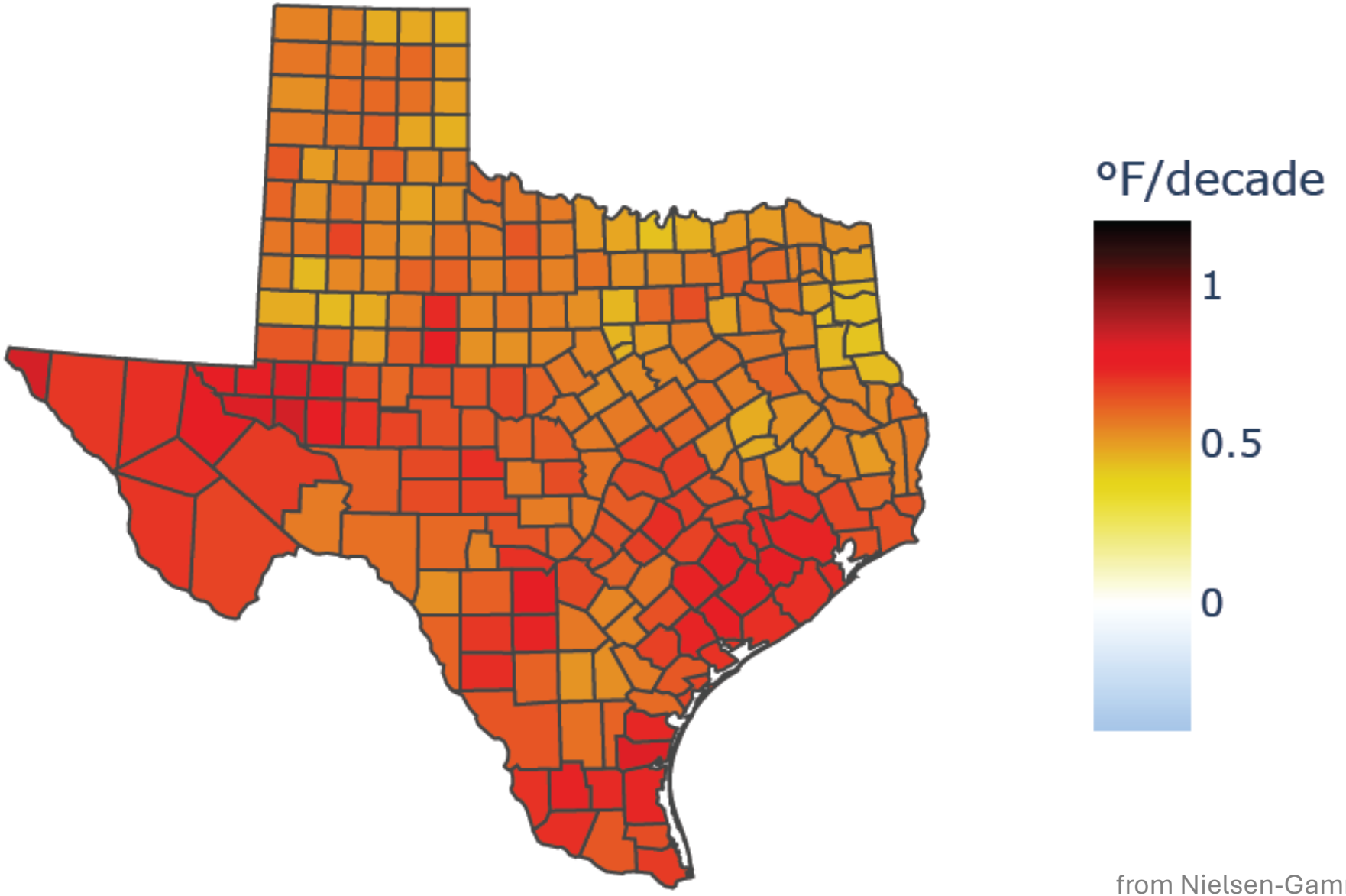




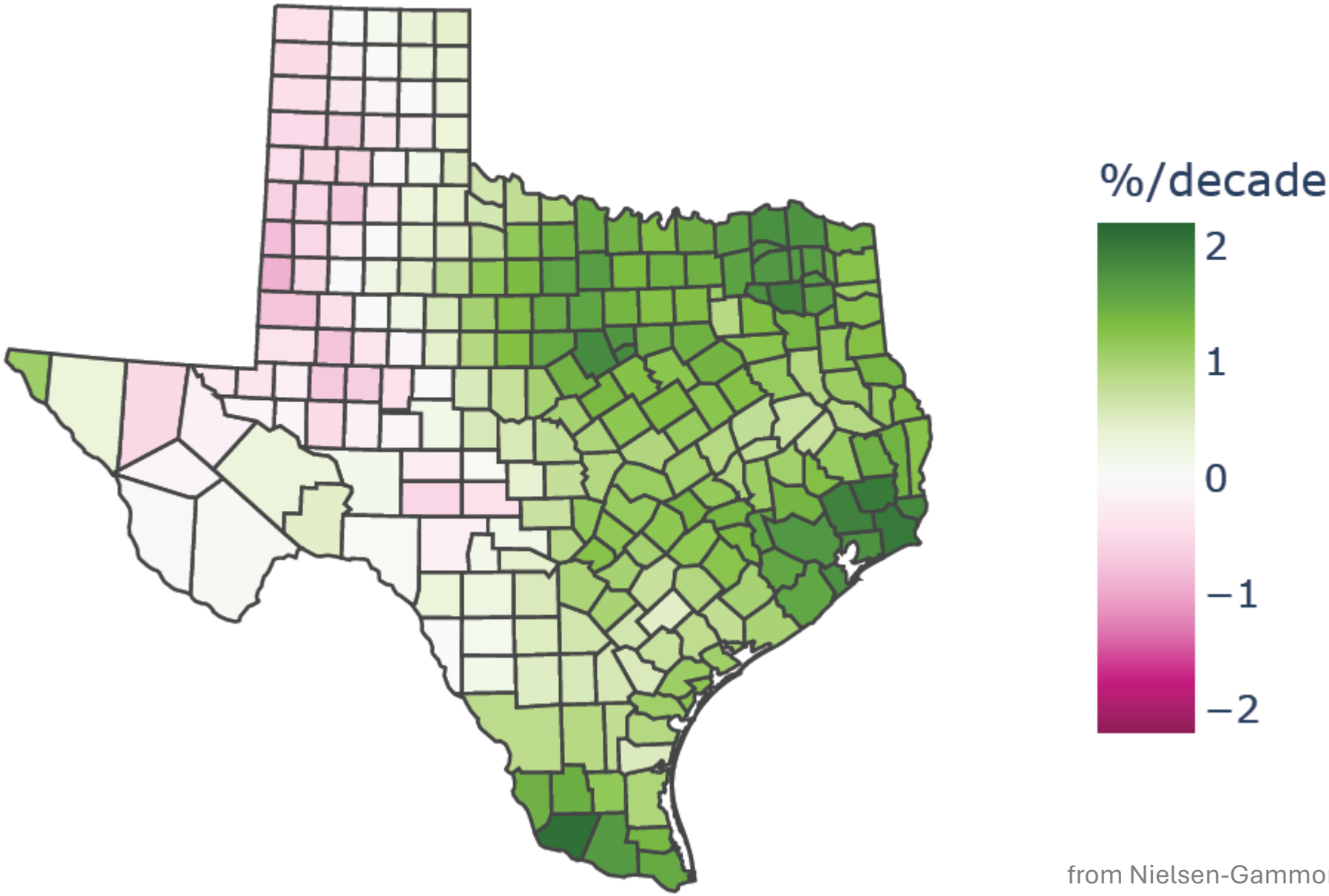
https://jalapeno.wp.txstate.edu/2024/11/06/normal-for-texas-surpasses-both-the-dust-bowl-and-the-drought-of-record/ *(from NCEI)*

Average Temperature Trend, 1975-2020



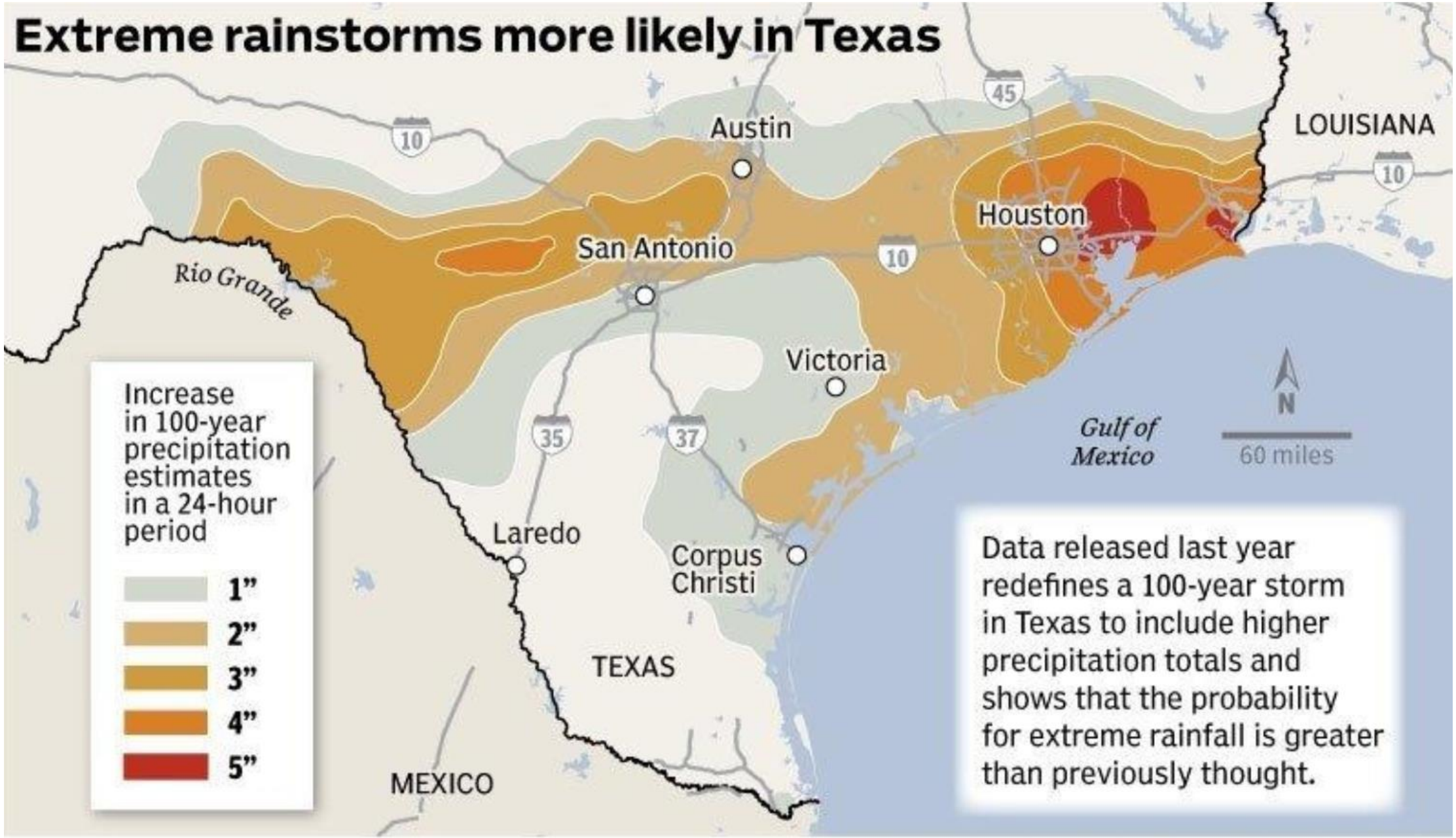
from Nielsen-Gammon and others (2021)

Overall Precipitation Trend, 1895-2020



from Nielsen-Gammon and others (2021)

Extreme rainstorms more likely in Texas



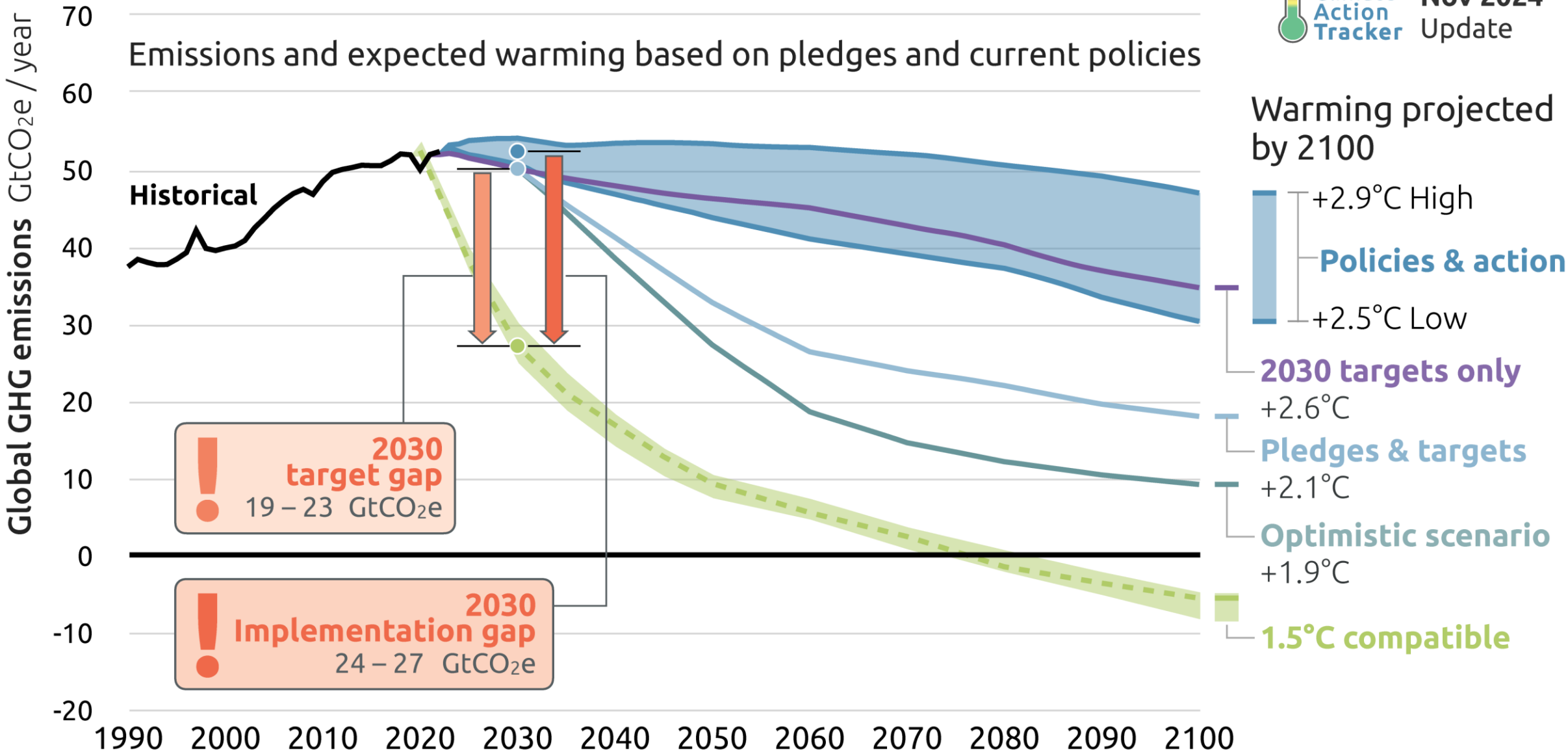
Source: National Oceanic and Atmospheric Administration; maps4news.com/©HERE

GATEHOUSE MEDIA

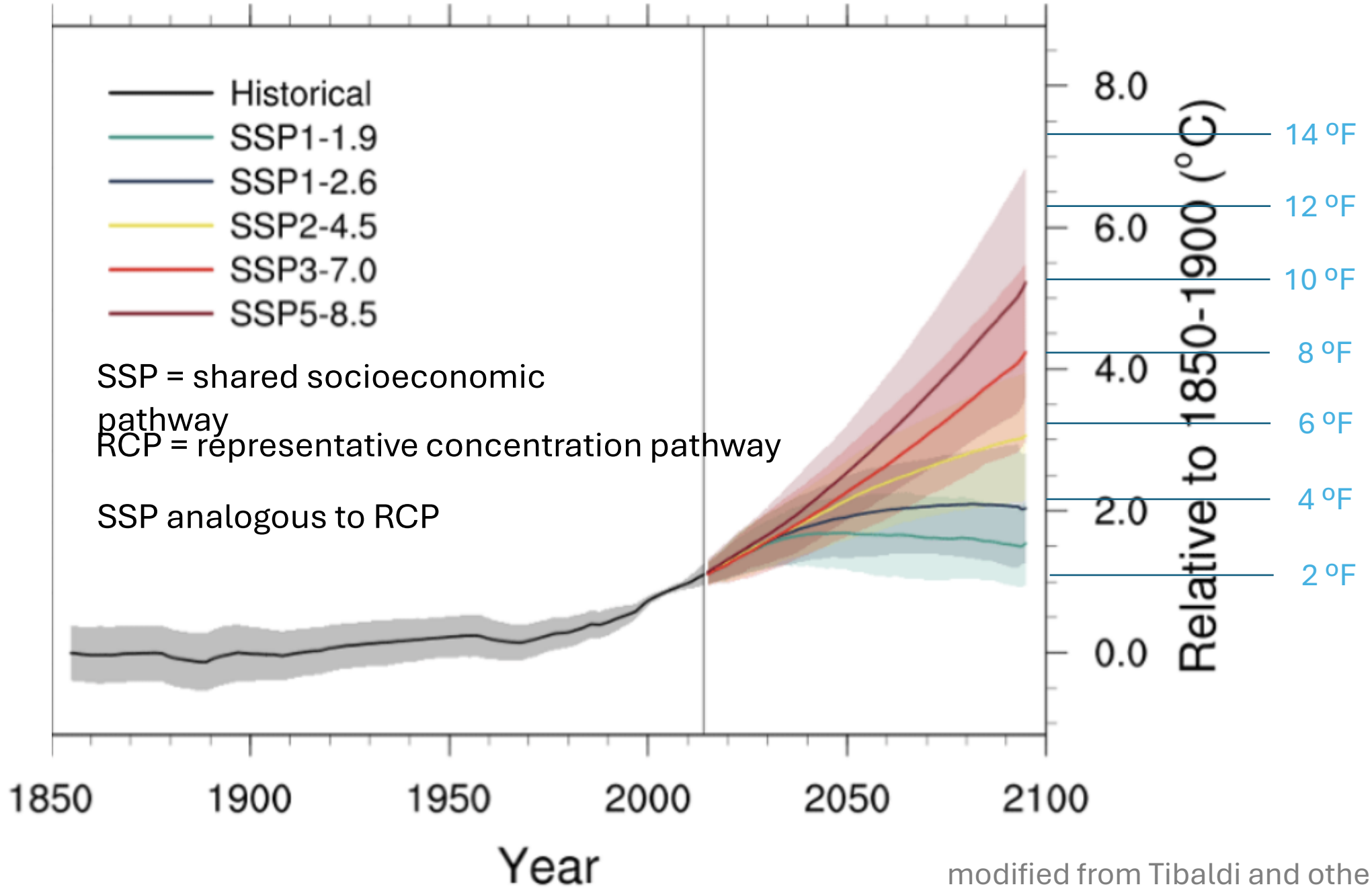
EMISSIONS PATHWAYS TO 2100

Emissions and expected warming based on pledges and current policies

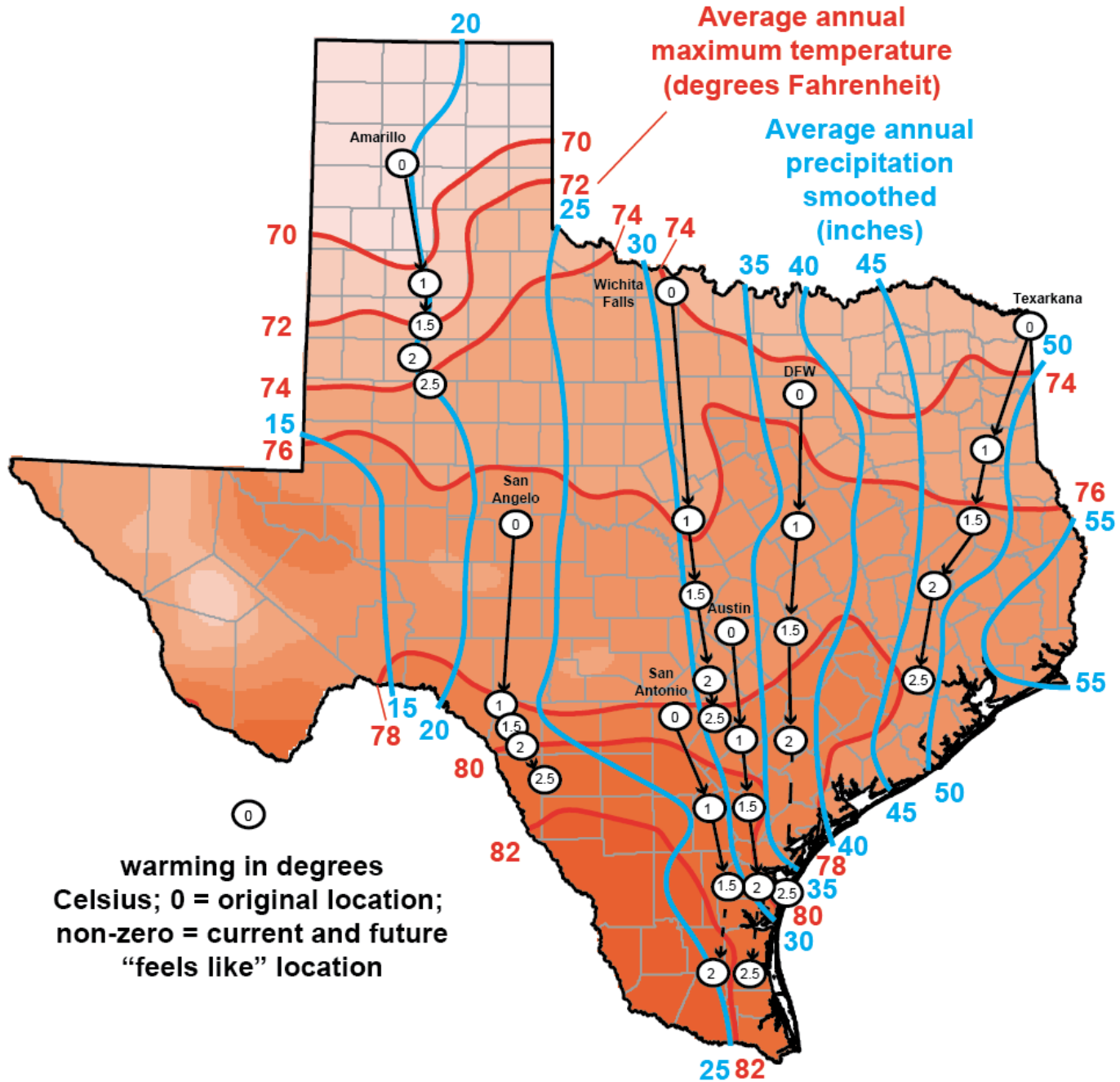
Climate Action Tracker **Nov 2024** Update



https://climateactiontracker.org/global/temperatures//



modified from Tibaldi and others 2021


Average annual maximum temperature (degrees Fahrenheit)
Average annual precipitation smoothed (inches)
Amarillo
Wichita Falls
Texarkana
DFW
San Angelo
Austin
San Antonio
warming in degrees Celsius; 0 = original location; non-zero = current and future "feels like" location

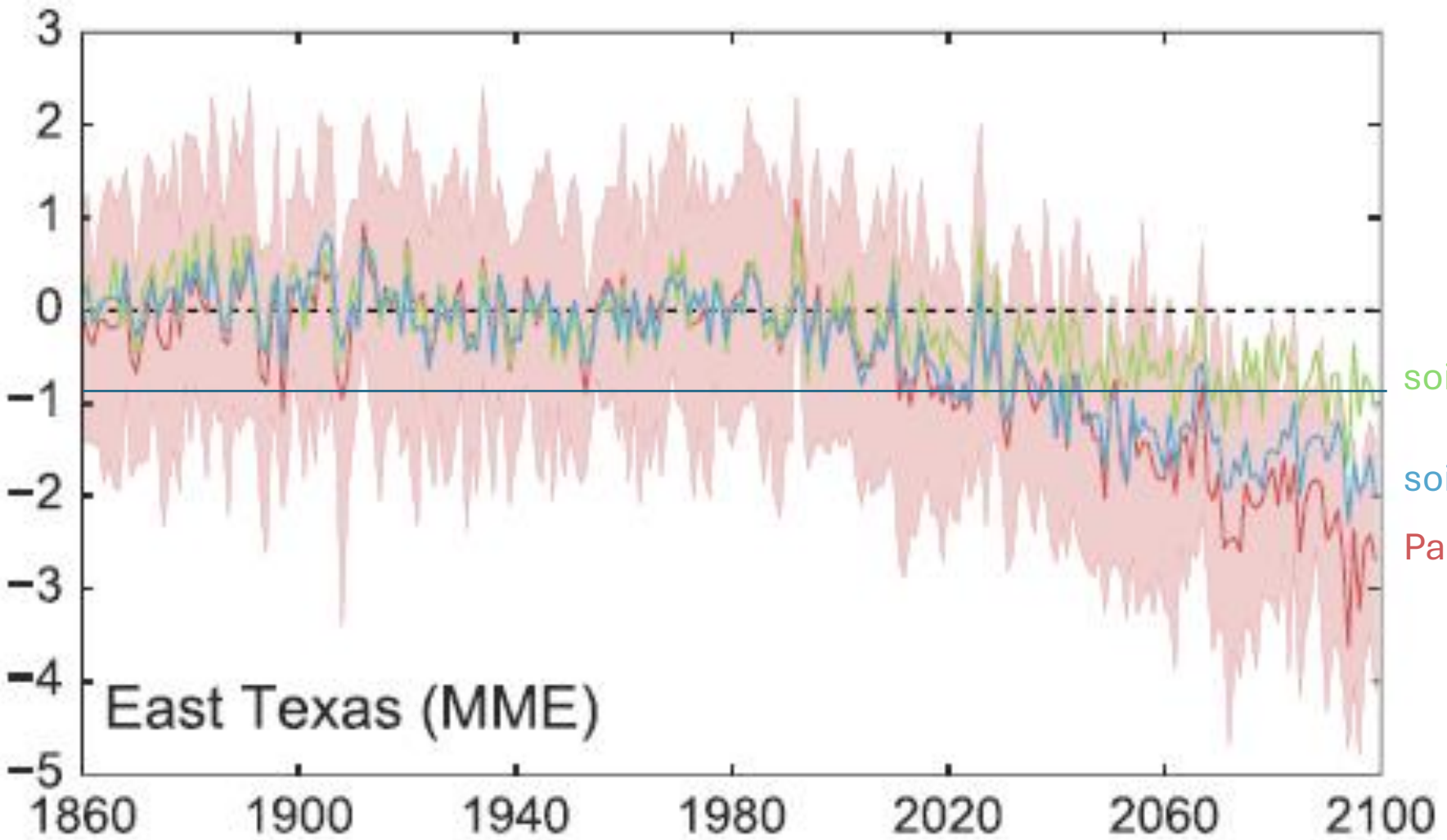
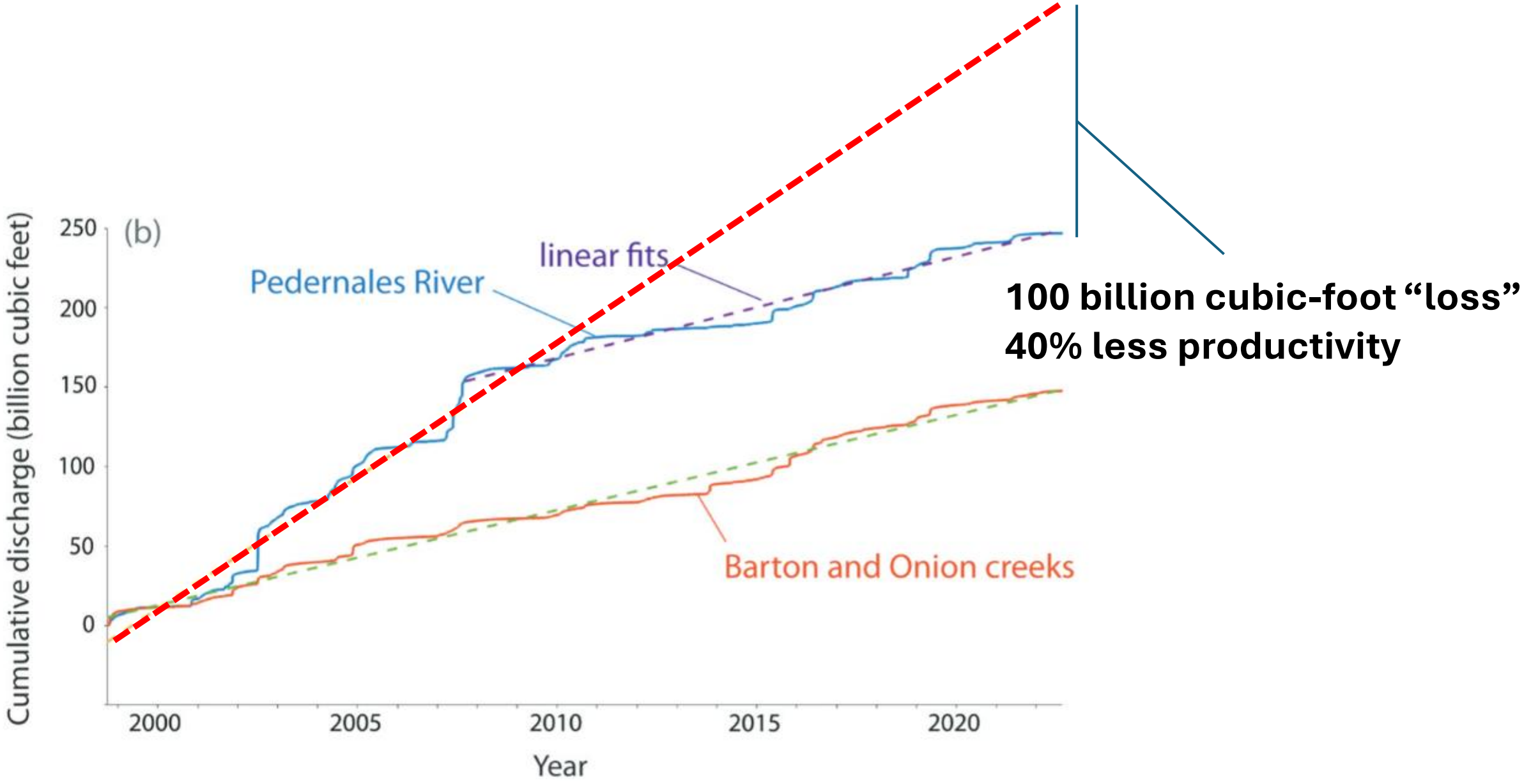
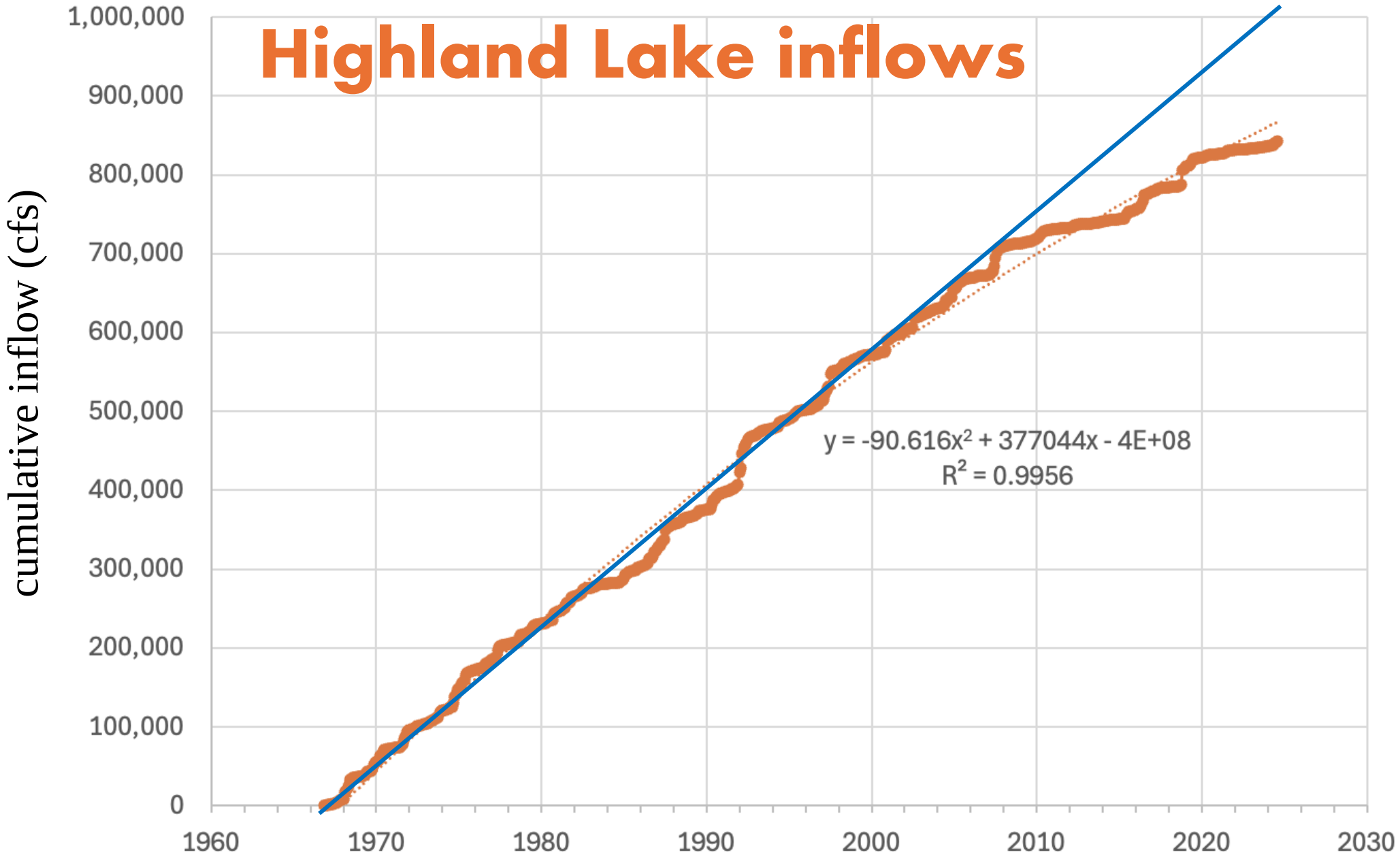


Figure 3. Multimodel ensemble simulations of historic and future projected (RCP 8.5) standardized Palmer Drought Severity Index (PDSI) and standardized soil moisture (SM) anomalies at 30-cm and 2-m depth for West Texas (top) and East Texas (bottom).

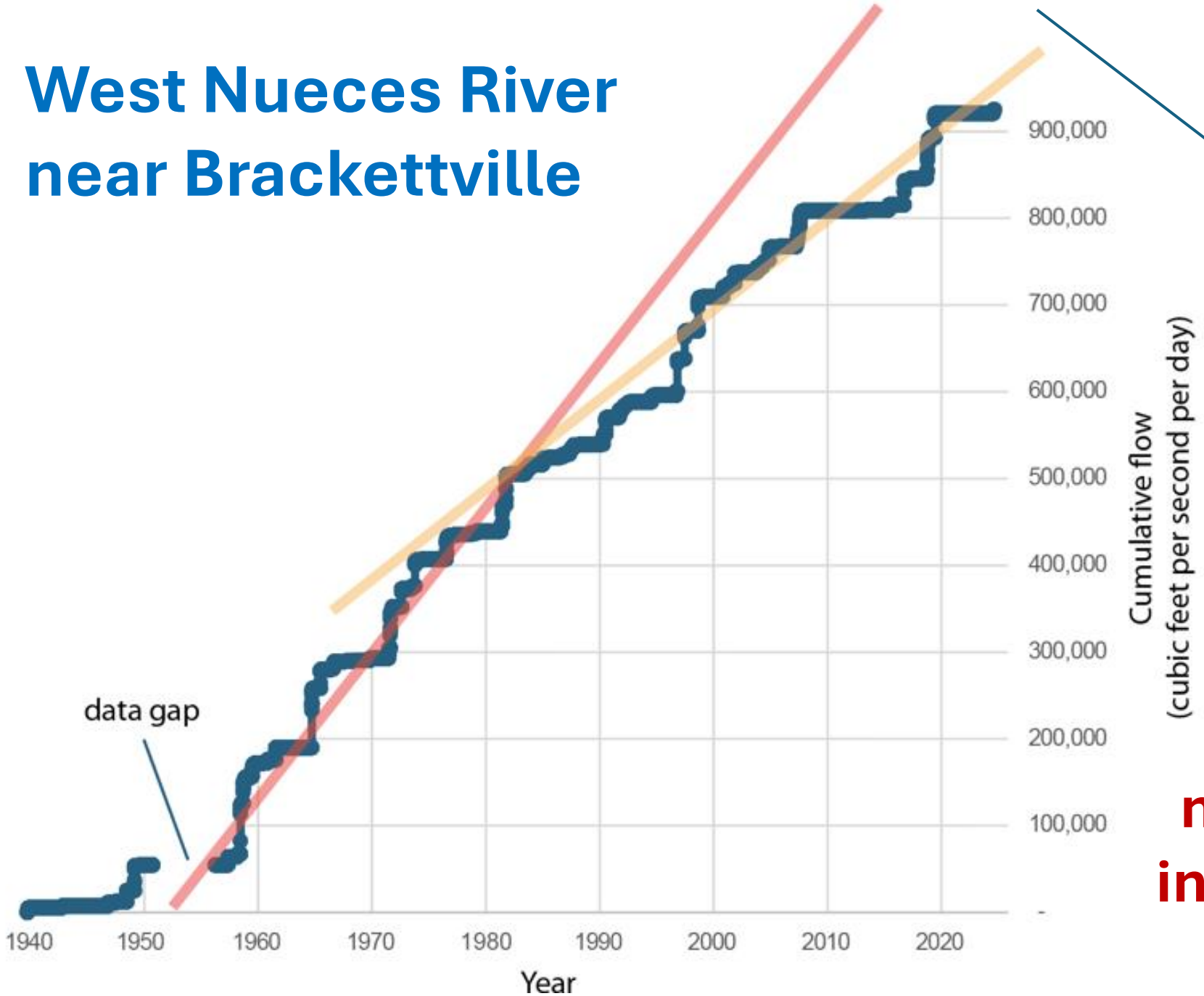
from Nielsen-Gammon and others (2020)



100 billion cubic-foot “loss”
40% less productivity

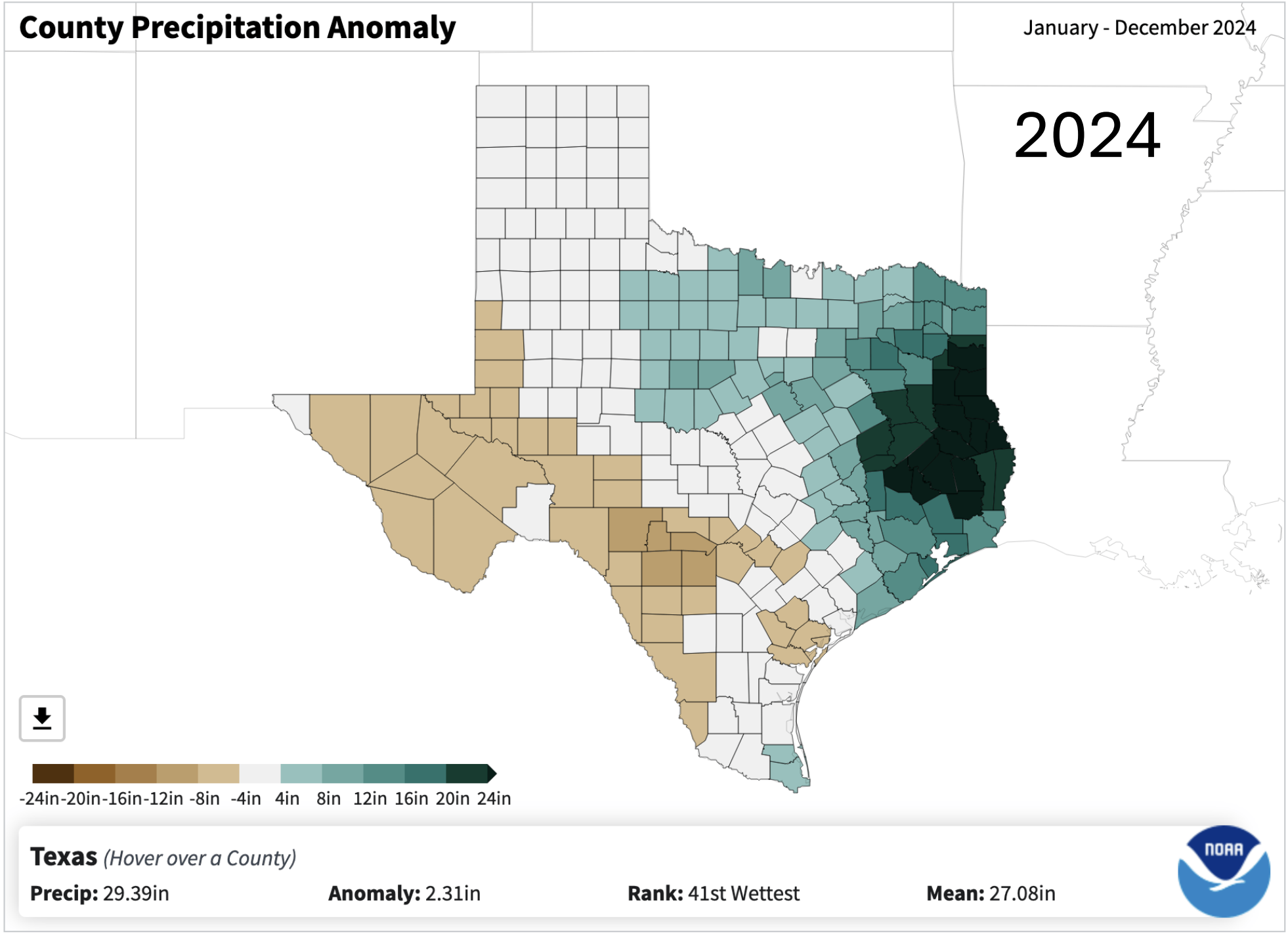

Highland Lake inflows
cumulative inflow (cfs)
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1960
1970
1980
1990
2000
2010
2020
2030
y = -90.616x² + 377044x - 4E+08
R² = 0.9956

West Nueces River near Brackettville



250,000 acre-foot "loss"
33% less productivity

may not be an issue in urban watersheds?


County Precipitation Anomaly
January - December 2024
2024
-24in -20in -16in -12in -8in -4in 4in 8in 12in 16in 20in 24in
Texas (Hover over a County)
Precip: 29.39in
Anomaly: 2.31in
Rank: 41st Wettest
Mean: 27.08in
NOAA

outline

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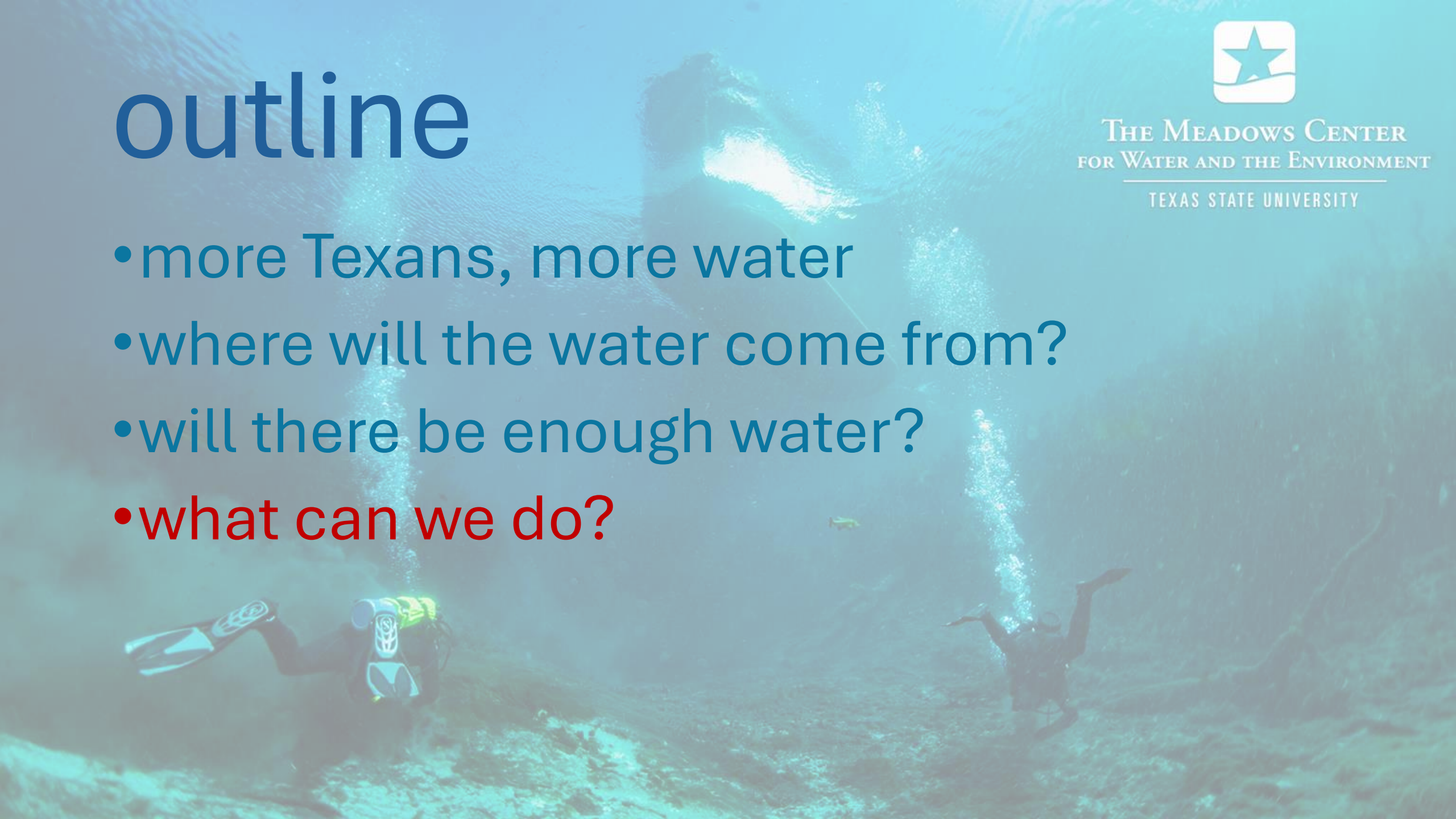
- where will the water come from?
- will there be enough water?
- what can we do?



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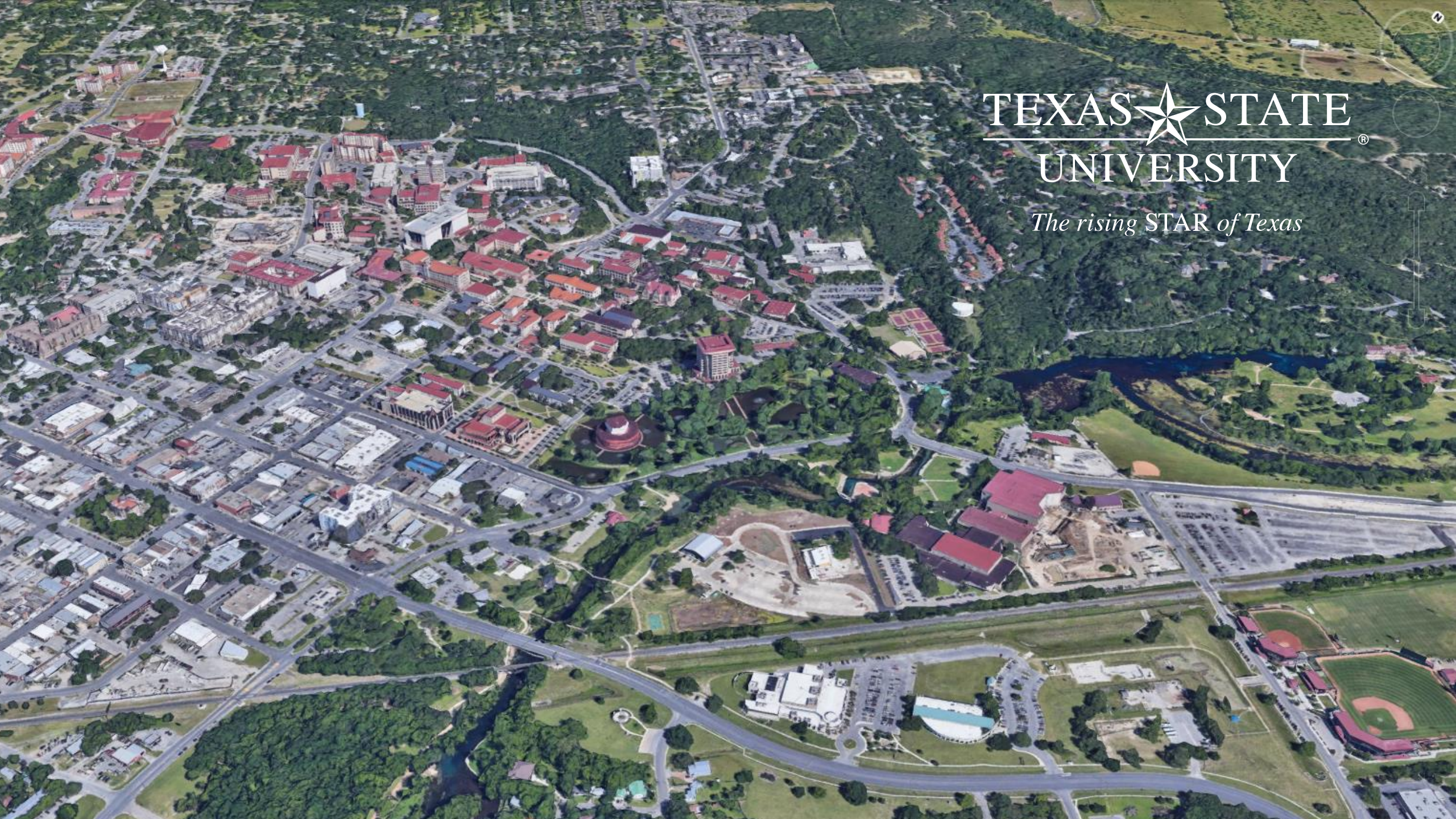
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- preserve groundwater/surface water interaction
  - riparian zones!
  - “If it’s wet, you bet!”
- minimize “urban karst” in streams
- prepare for worse droughts
- prepare for worse floods
- consider the future when planting in the present
- look for unintended consequences
- use reuse?
  - “If it’s wet, you bet!”
- involve the public (Texas Stream Team!)
- support infrastructure?
  - “If it’s wet, you bet!”

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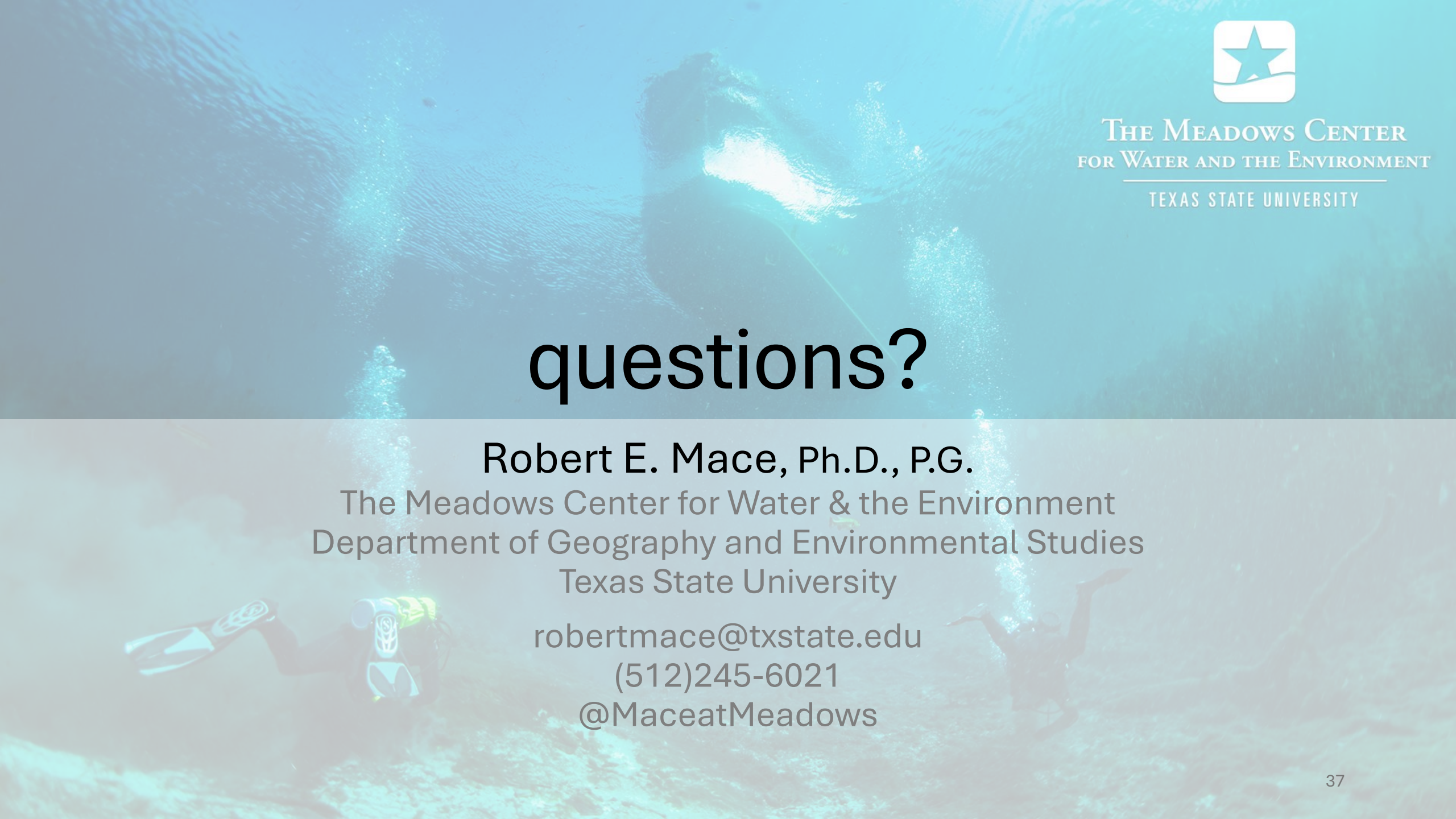
The rising STAR of Texas

www.meadowscenter.txst.edu

TEXAS + WATER
texaspluswater.org

HOTTER THAN A HABANERO

Texas Water Journal



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questions?

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