Water Load vs. Electricity Load in Texas

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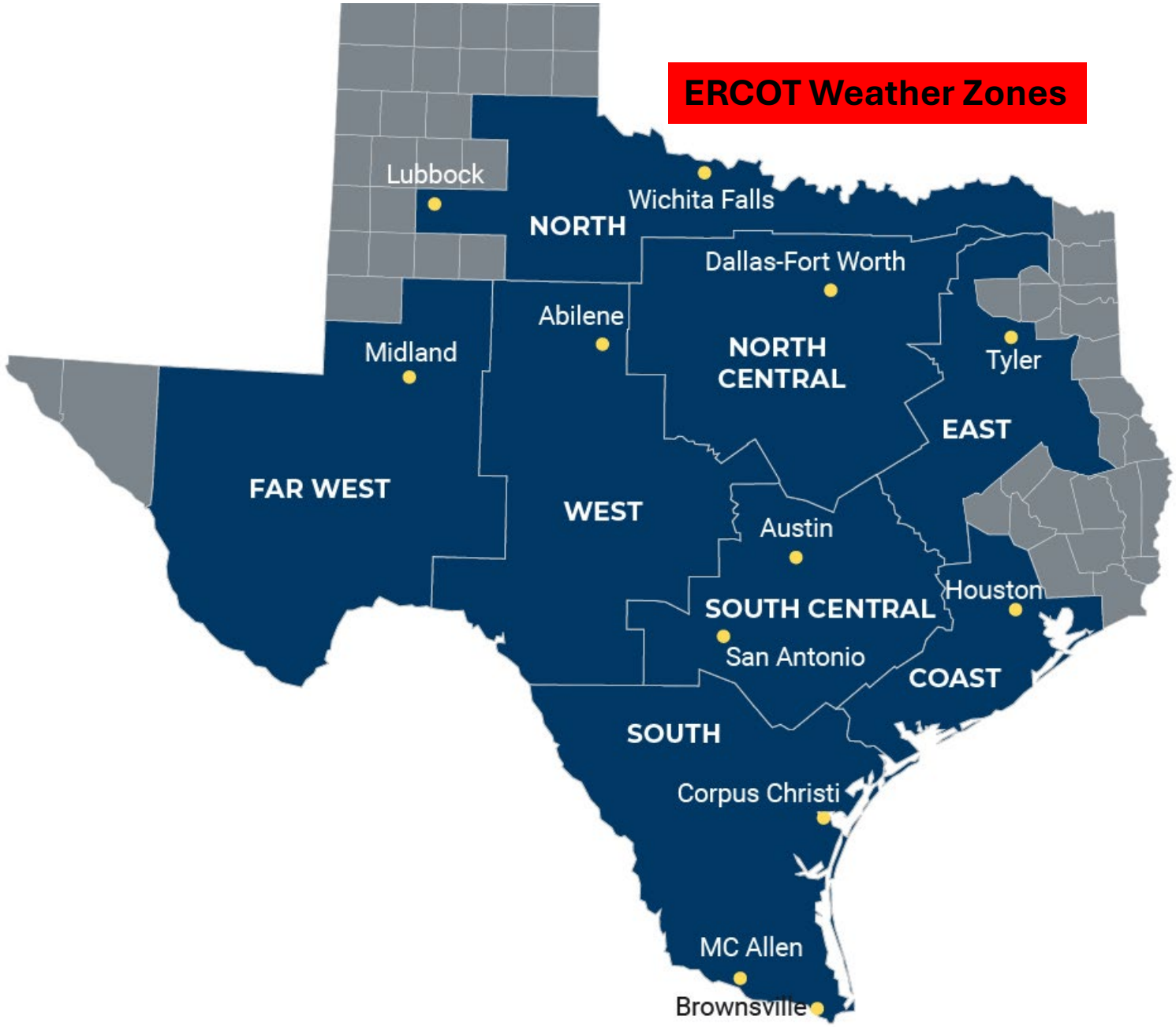
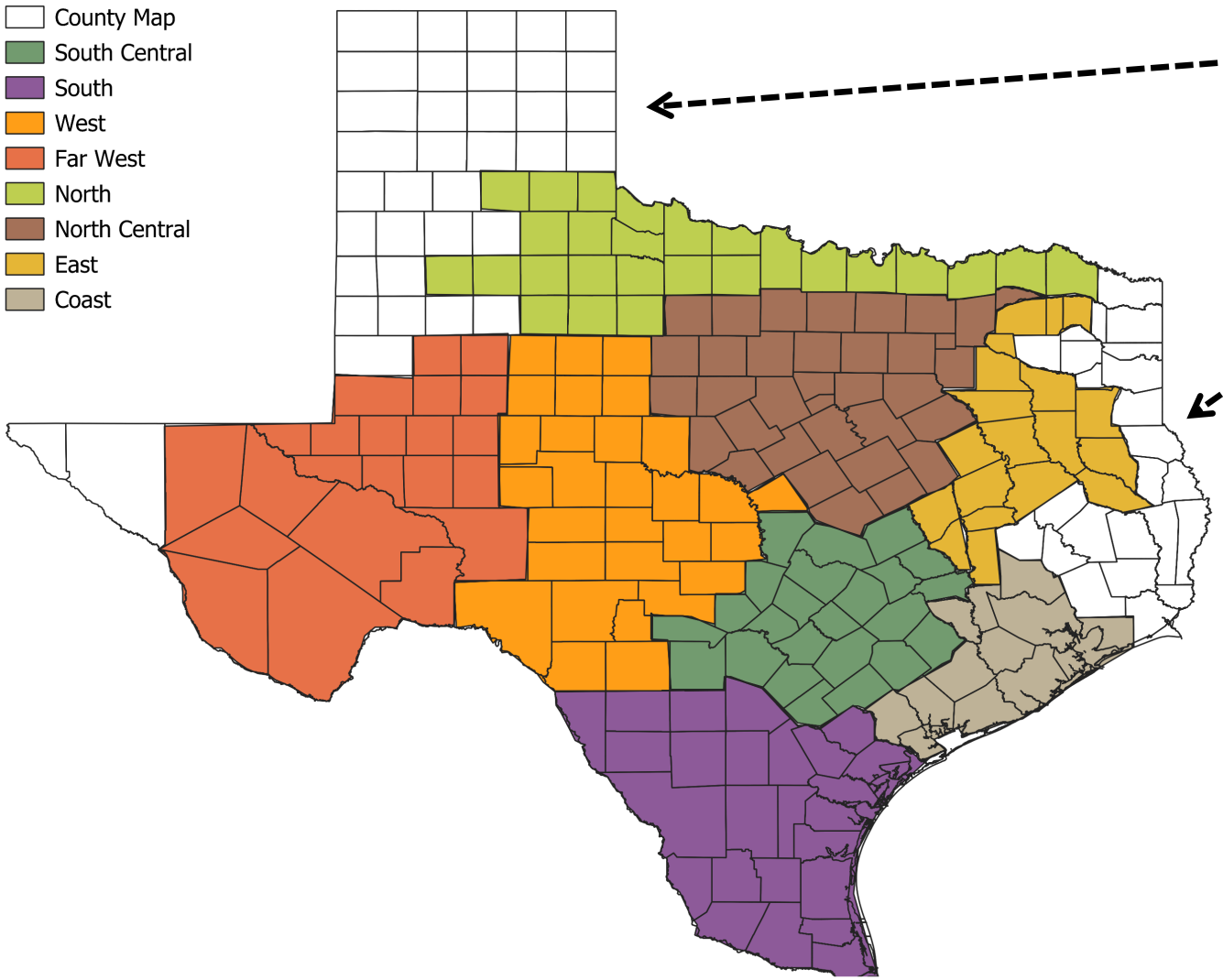
What Do We Mean by “Water Load?”

- ERCOT defines “load” as “The amount of energy in MWh delivered at any specified point or points on a system.”
- It reports electricity load for Texas on a zonal basis.
- These are shown in the on the right-hand size of this page
- I have used QGIS to reproduce this map and superimposed it over a map of the countries of Texas, so that we could make an accurate apples-to-apples geographic comparison of water usage (reported annually by the Texas Water Development Board at the county level) and electricity load.
- The head-to-head comparison is why we speak of “water load” in this analysis



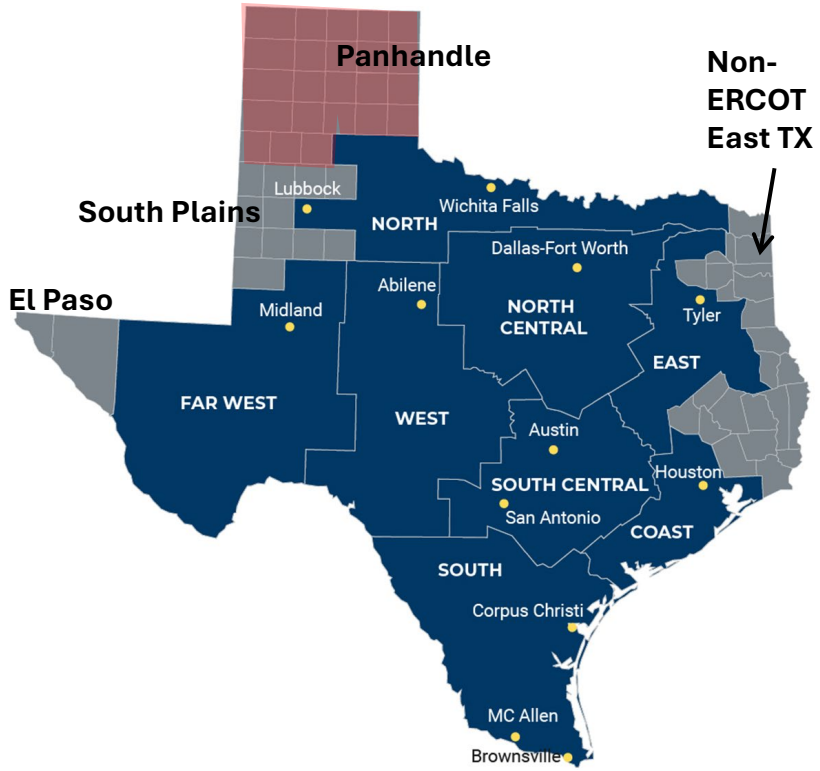
Our Reproduced Load Zone Map



We will also show water load estimates for the Panhandle, South Plains, and Exempt East Texas counties not covered in the ERCOT weather zone map

Summary of Findings

Zone	2021 Water Use, AF	2000-2021 Change in Water Use	2002-2024 Change in Peak Electricity Load	2000-2021 Population Change
East	485,162	35%	33%	217,743 (24%)
West	494,693	-30%	40%	43,500 (8%)
North	661,076	-15%	19%	95,269 (14%)
Far West	732,608	33%	310%	105,267 (25%)
South-Central	1,209,808	13%	64%	2,076,880 (63%)
South	1,592,006	28%	69%	536,812 (29%)
North-Central	1,664,828	6%	33%	2,742,546 (48%)
Coast	2,050,722	-9%	60%	2,543,031 (51%)
El Paso	391,593	-38%	N/A	188,268 (28%)
Panhandle	2,736,201	-25%	N/A	34,755 (9%)
South Plains	1,502,835	-36%	N/A	-4,637 (-2%)
Non-ERCOT East Texas	862,126	-20%	N/A	96,688 (8%)
Total	14,383,658			8,676,122

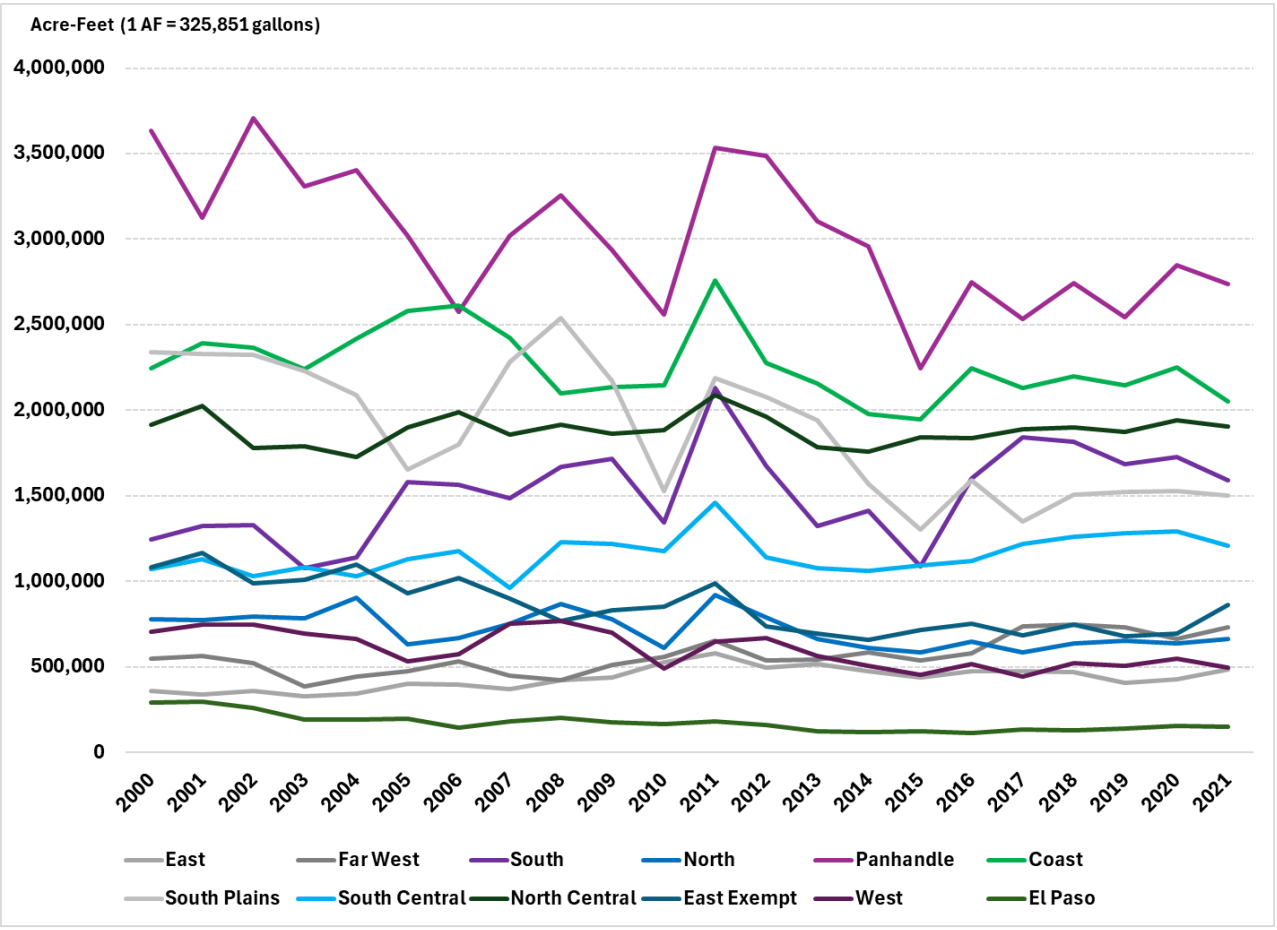


Weather Zones and Corresponding Water Load Zones

Arranged Smallest-to-Largest (based on Electricity Load)

All Water Load Zones

Raw Volume, AF



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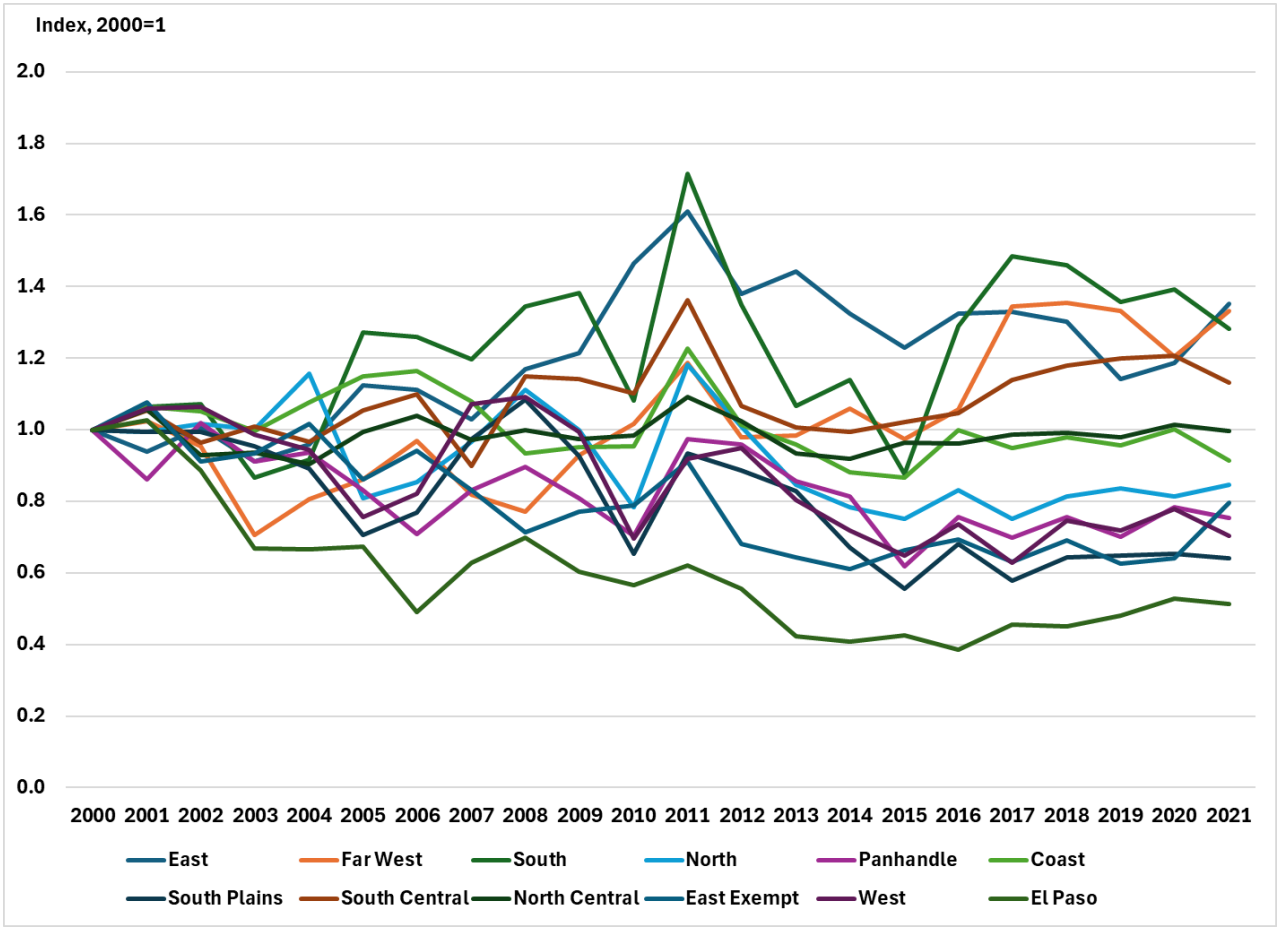
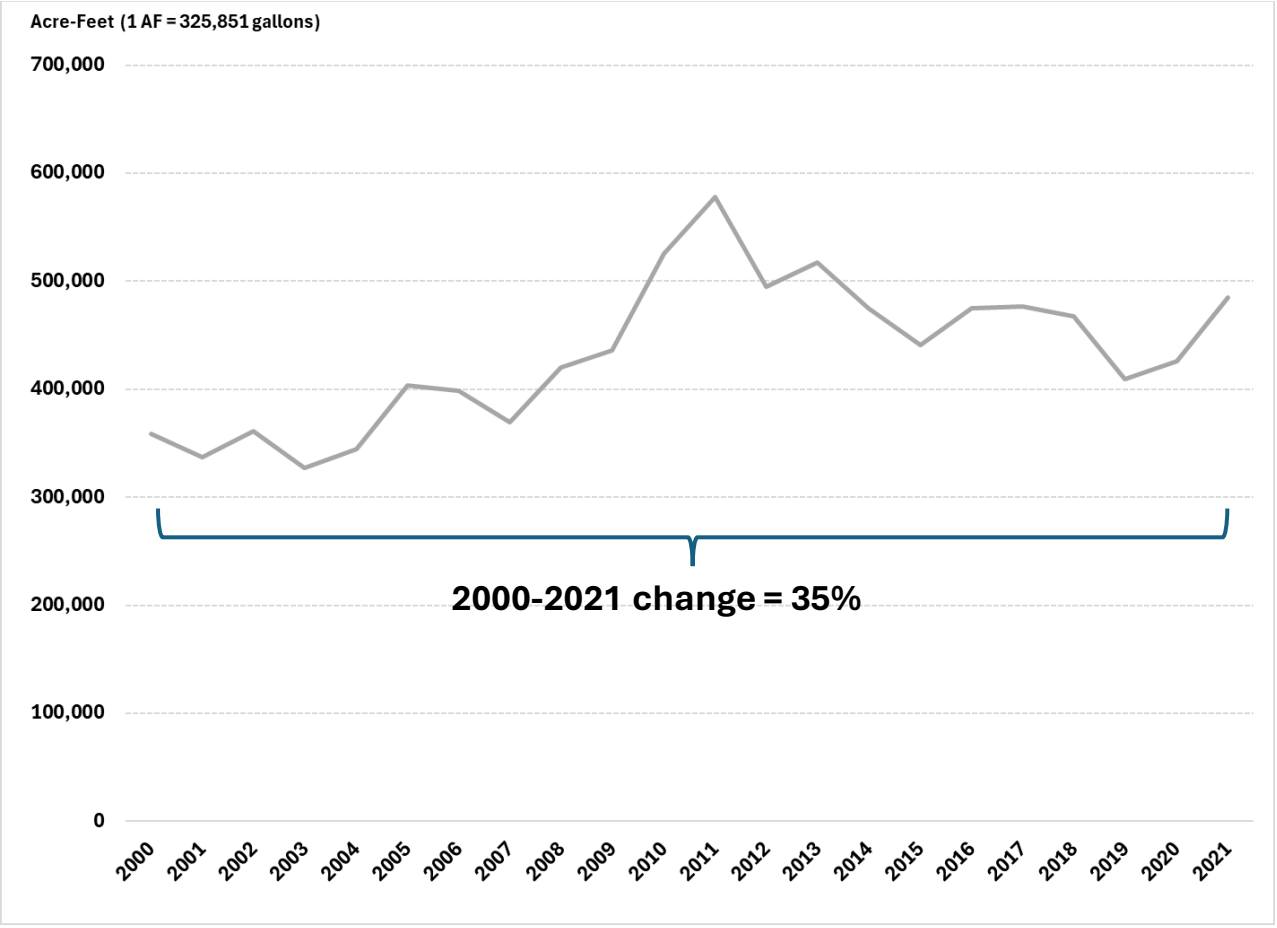


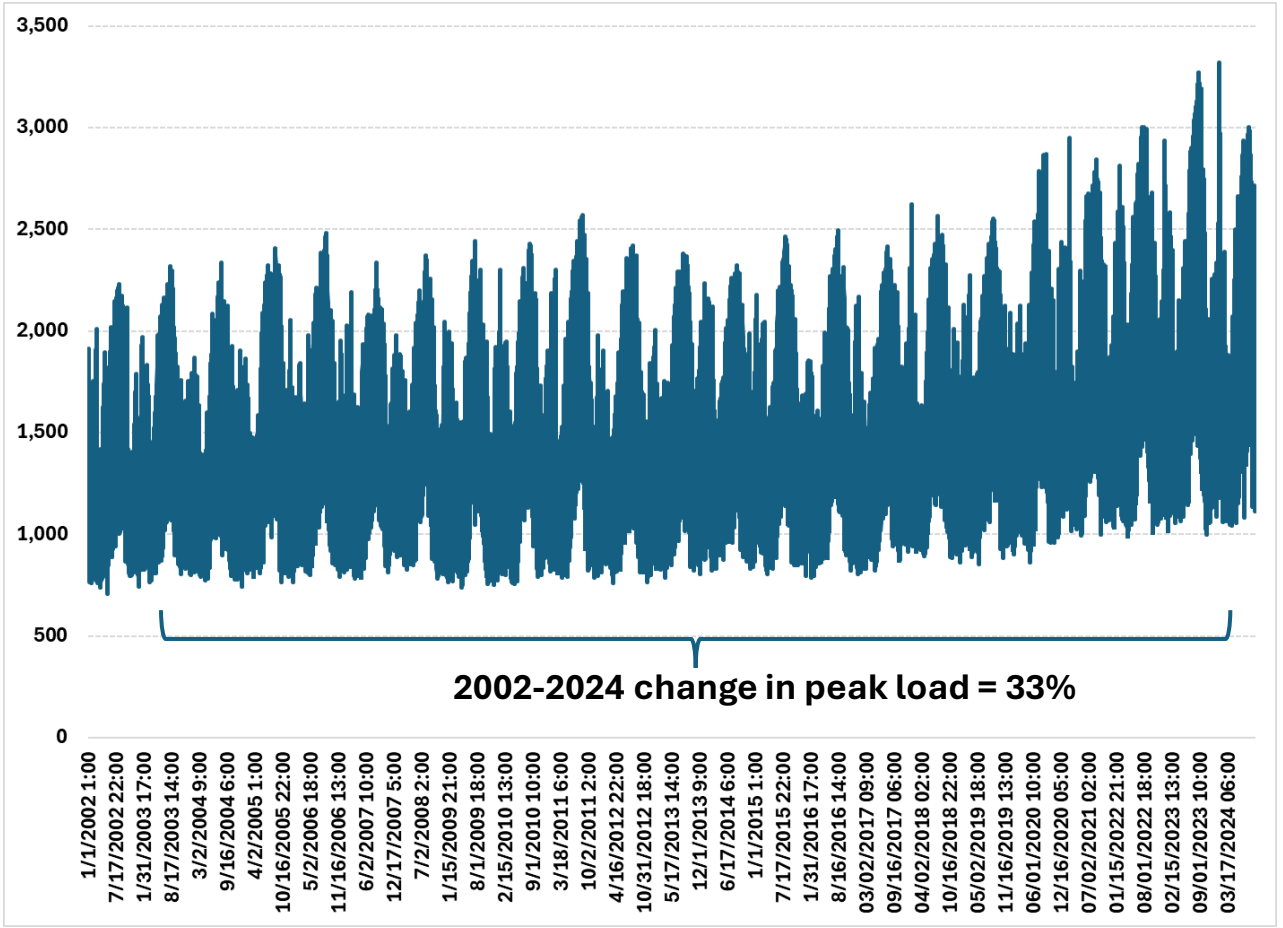
East Load Zone

Annual Water Use, AF



Source: TWDB, Author's Analysis

Hourly Electricity Load, MW

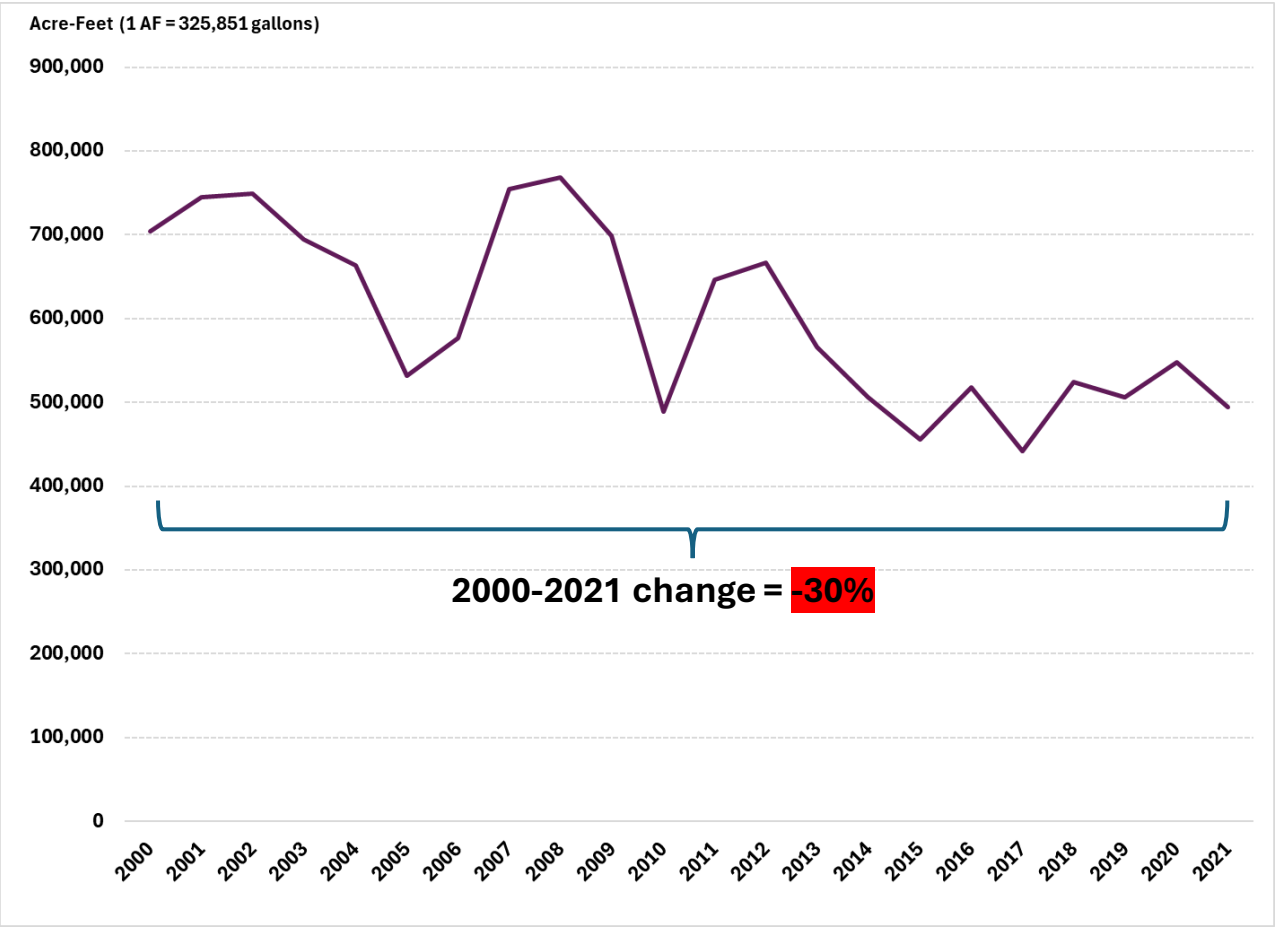


Source: ERCOT, Author's Analysis

2000-2021 Population Change: 24%

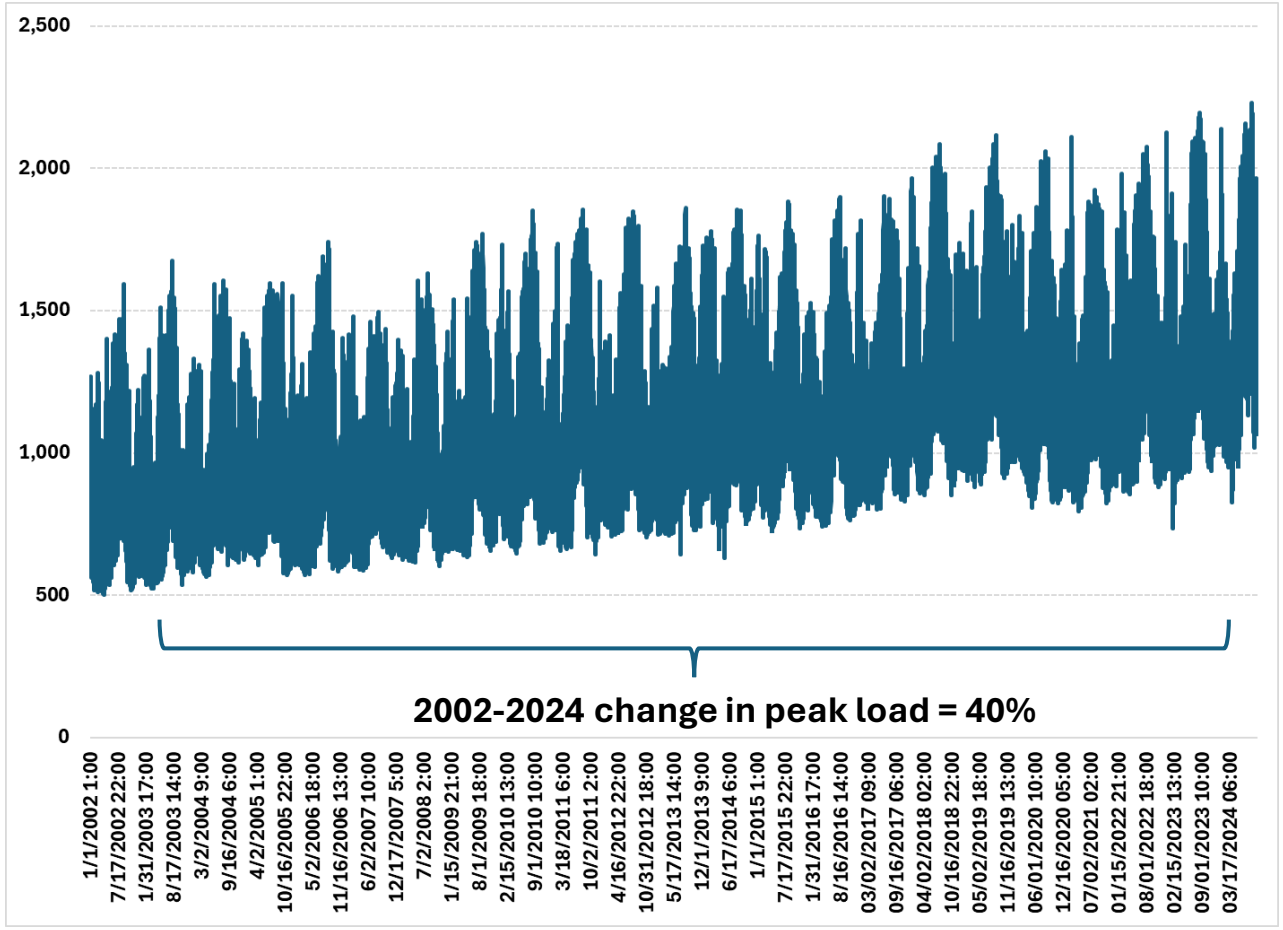
West Load Zone

Annual Water Use, AF



Source: TWDB, Author's Analysis

Hourly Electricity Load, MW

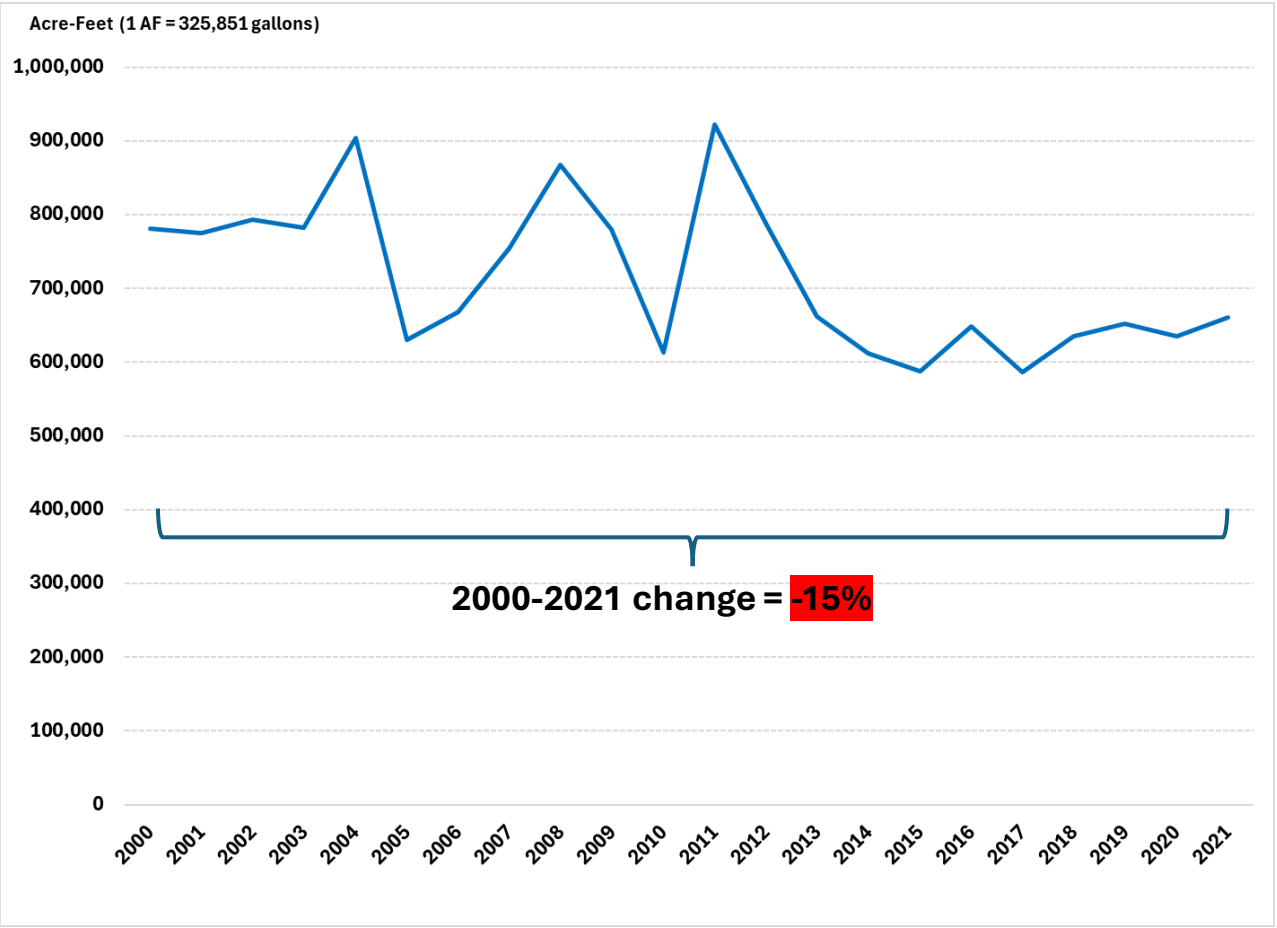


Source: ERCOT, Author's Analysis

2000-2021 Population Change: 8%

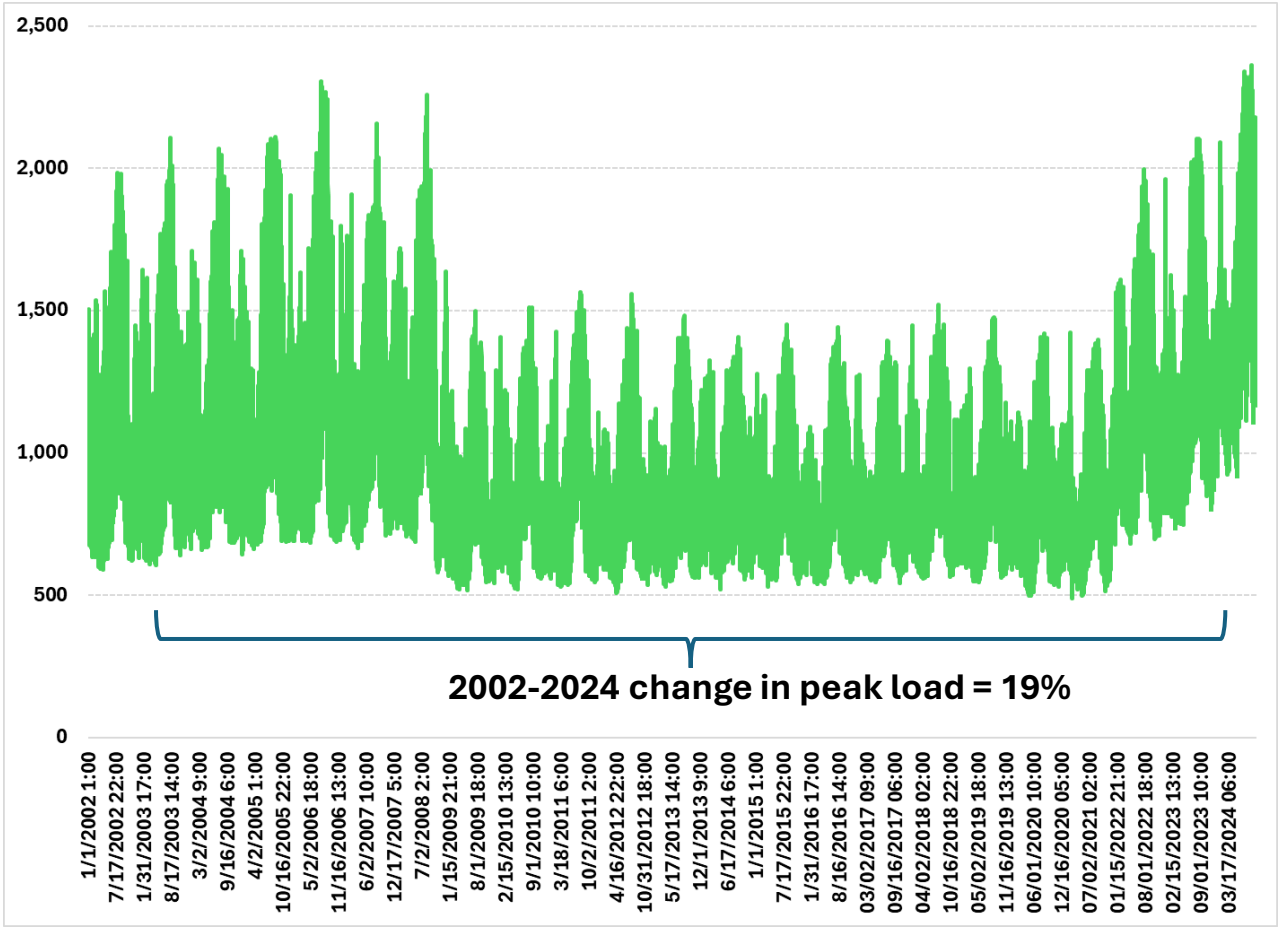
North Load Zone

Annual Water Use, AF



Source: TWDB, Author's Analysis

Hourly Electricity Load, MW

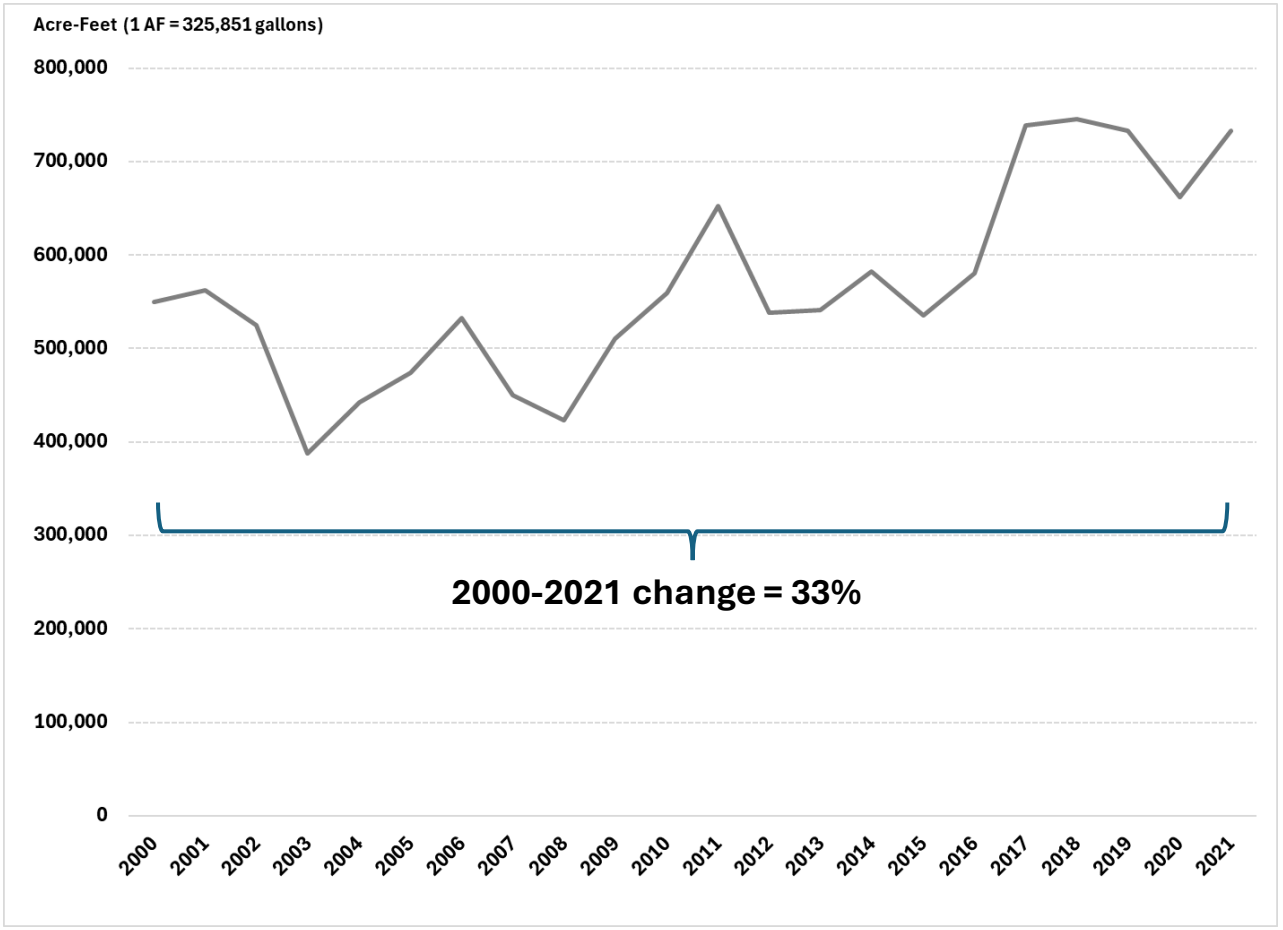


Source: ERCOT, Author's Analysis

2000-2021 Population Change: 14%

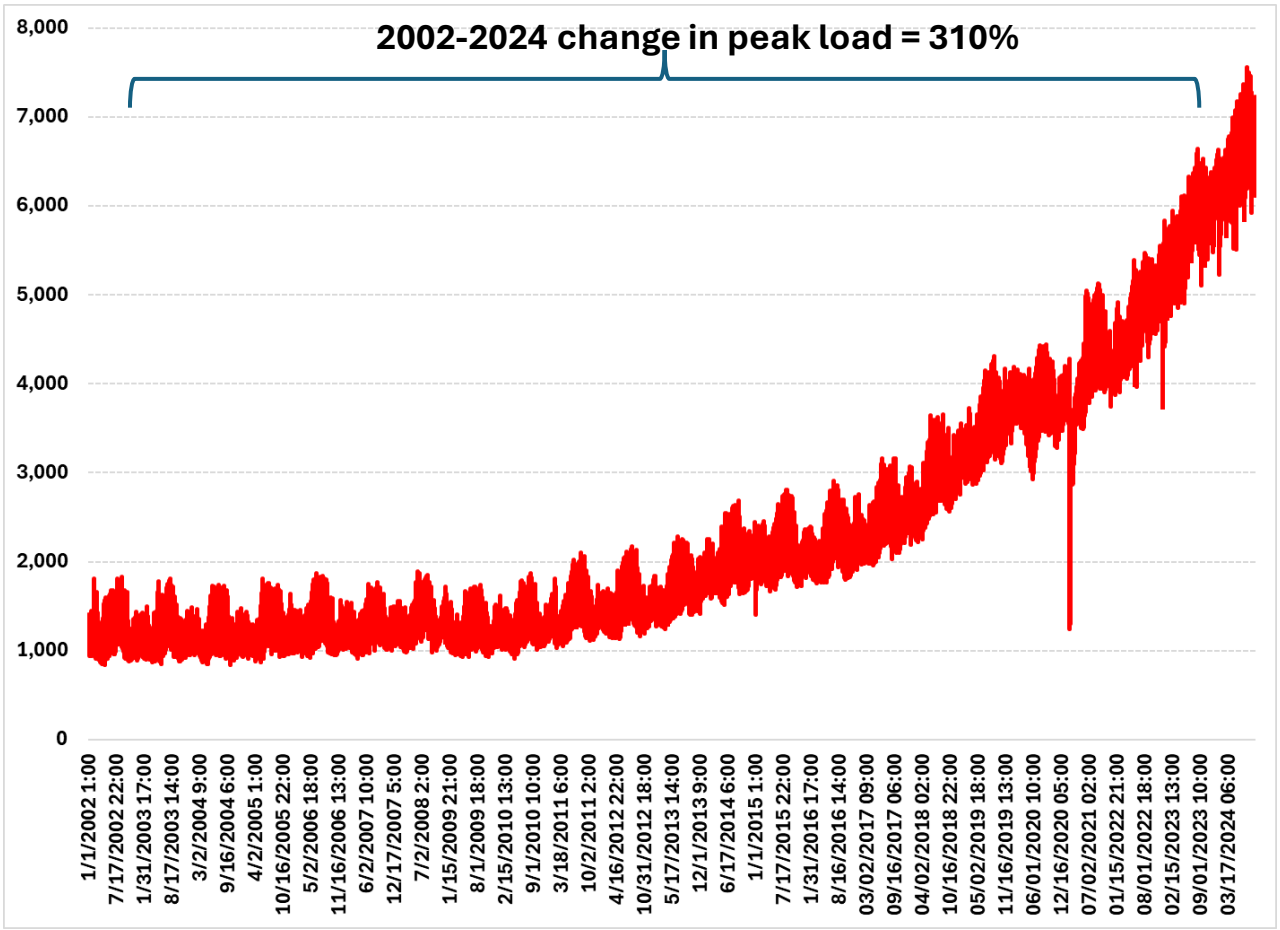
Far West Load Zone

Annual Water Use, AF



Source: TWDB, Author's Analysis

Hourly Electricity Load, MW

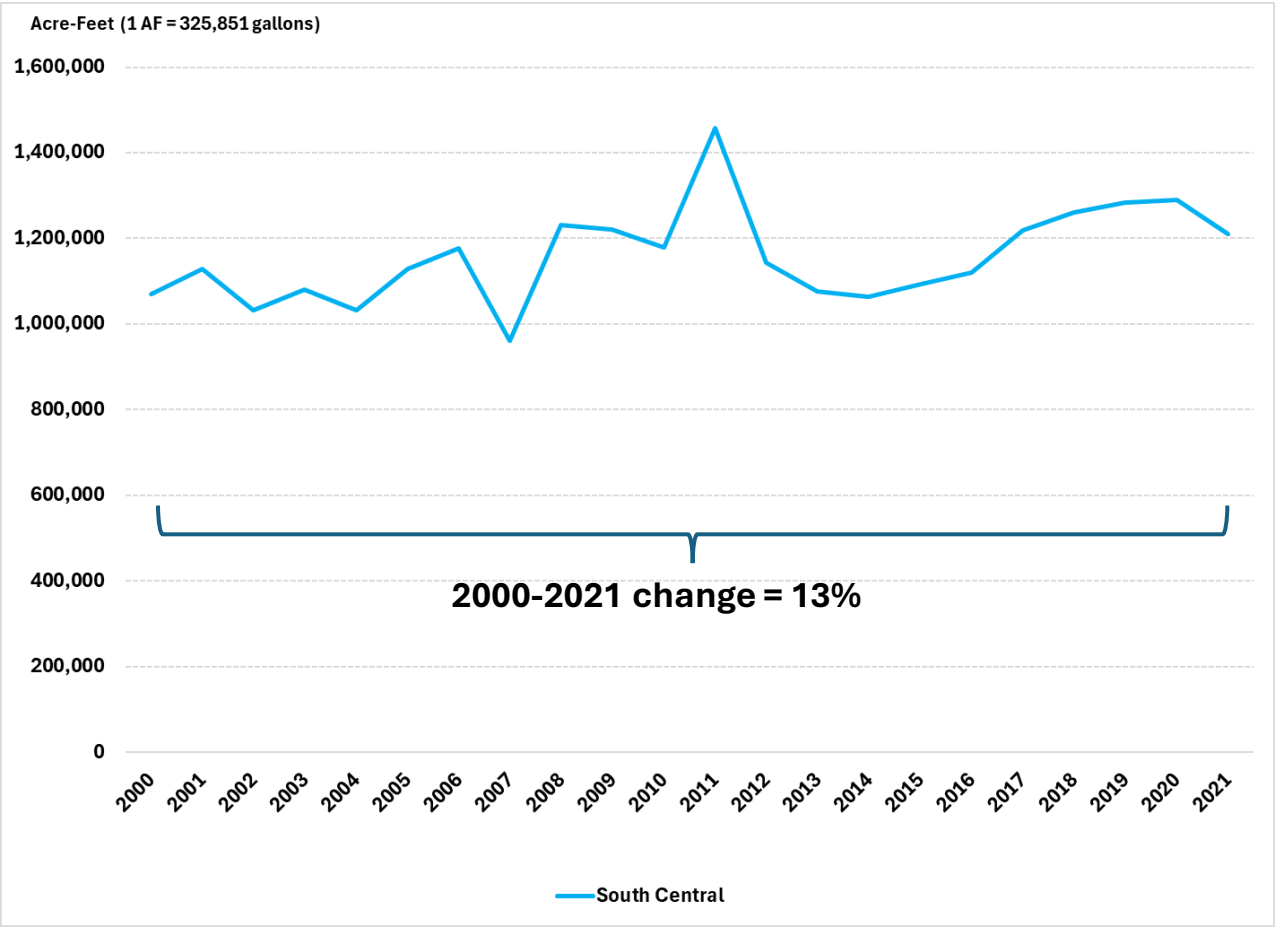


Source: ERCOT, Author's Analysis

2000-2021 Population Change: 25%

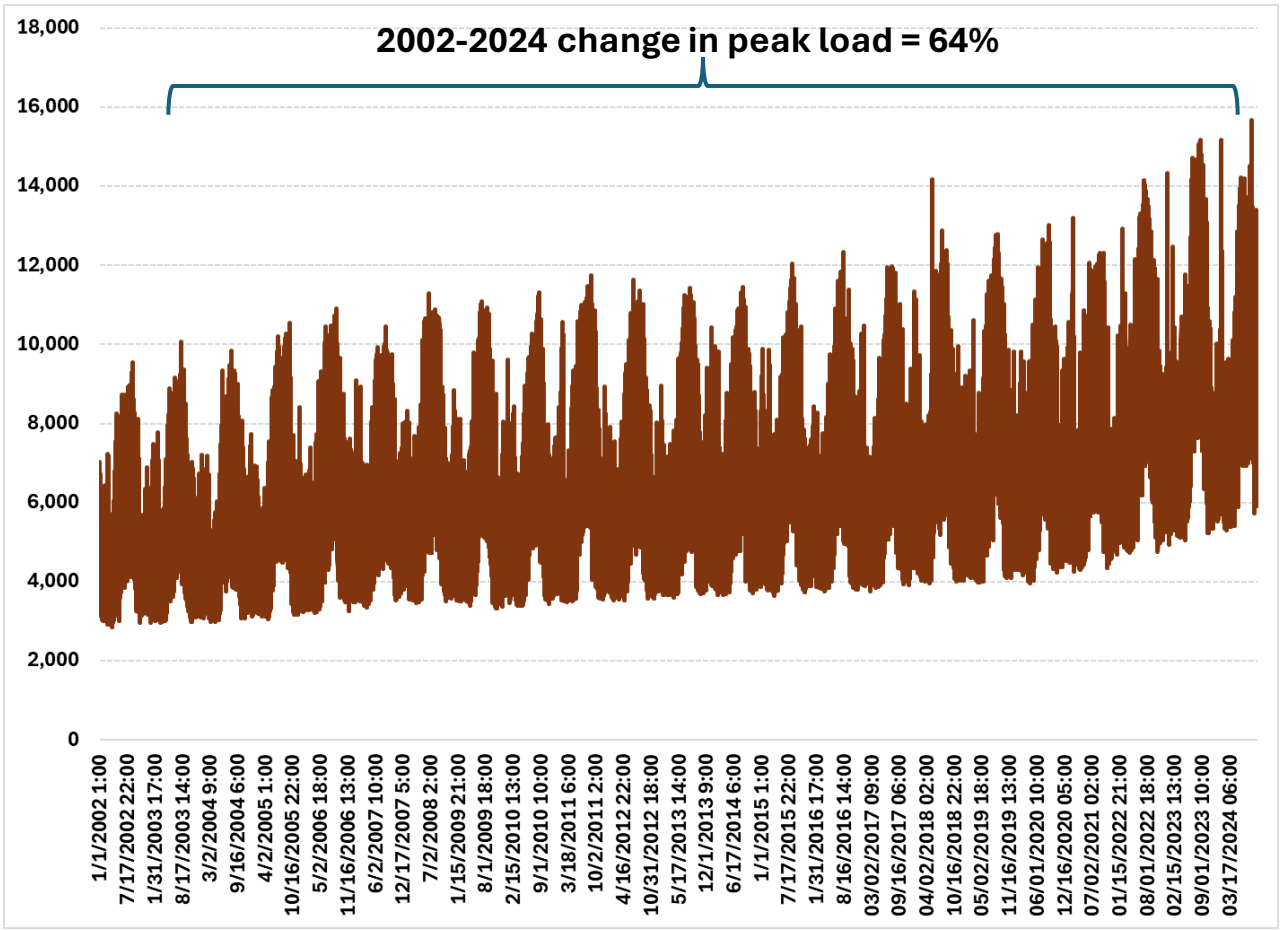
South-Central Load Zone

Annual Water Use, AF



Source: TWDB, Author's Analysis

Hourly Electricity Load, MW

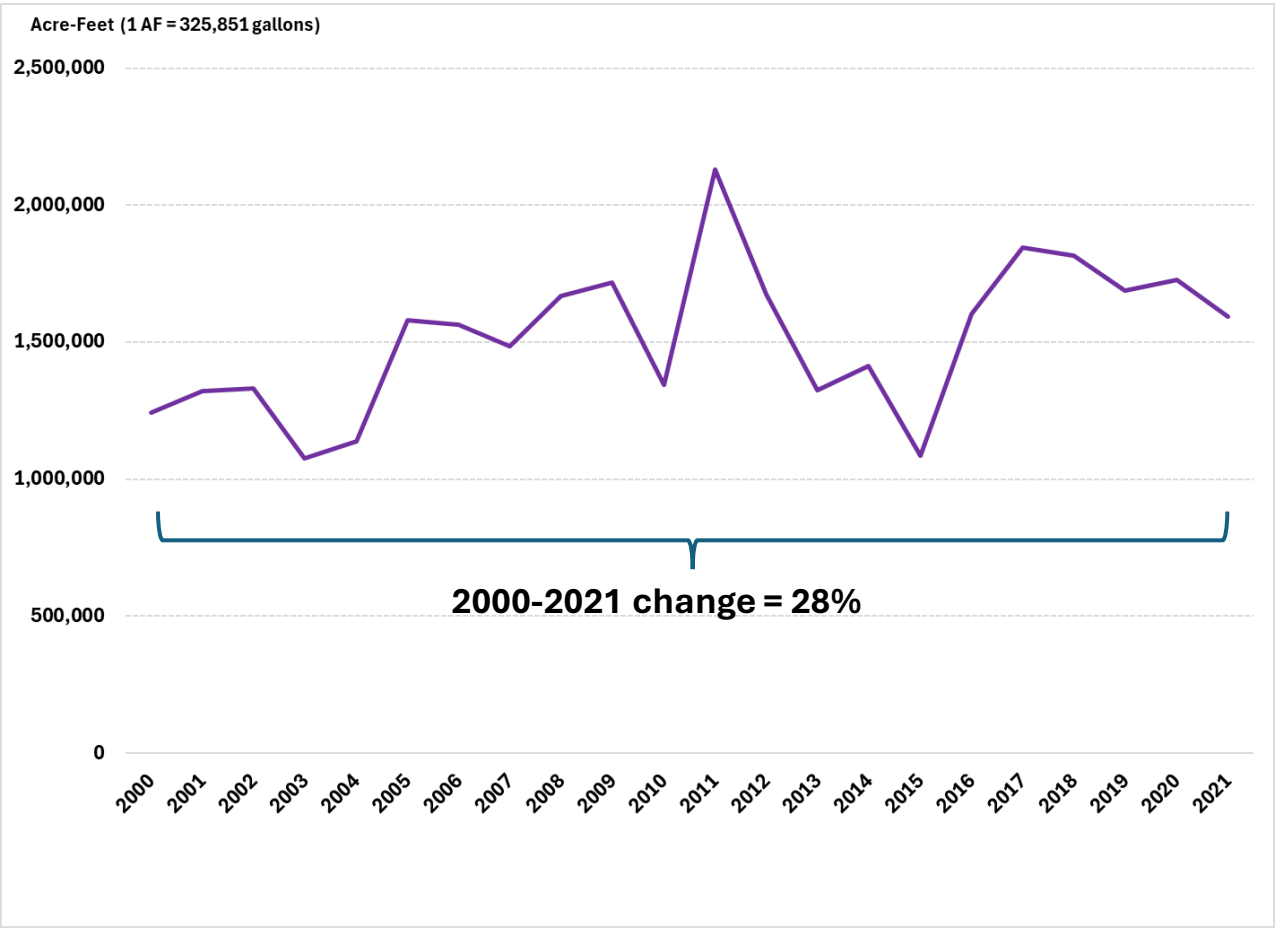


Source: ERCOT, Author's Analysis

2000-2021 Population Change: 63%

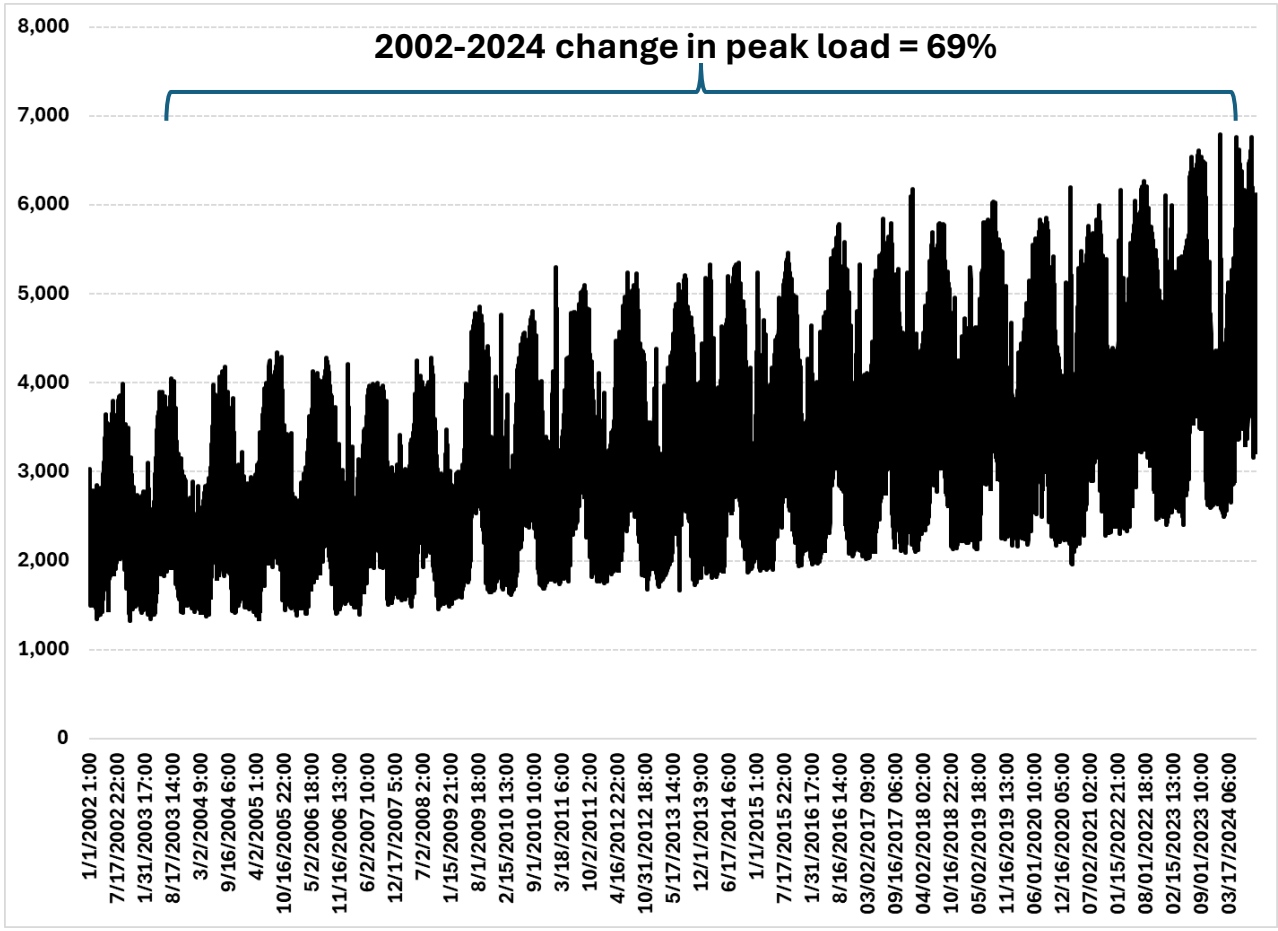
South Load Zone

Annual Water Use, AF



Source: TWDB, Author's Analysis

Hourly Electricity Load, MW

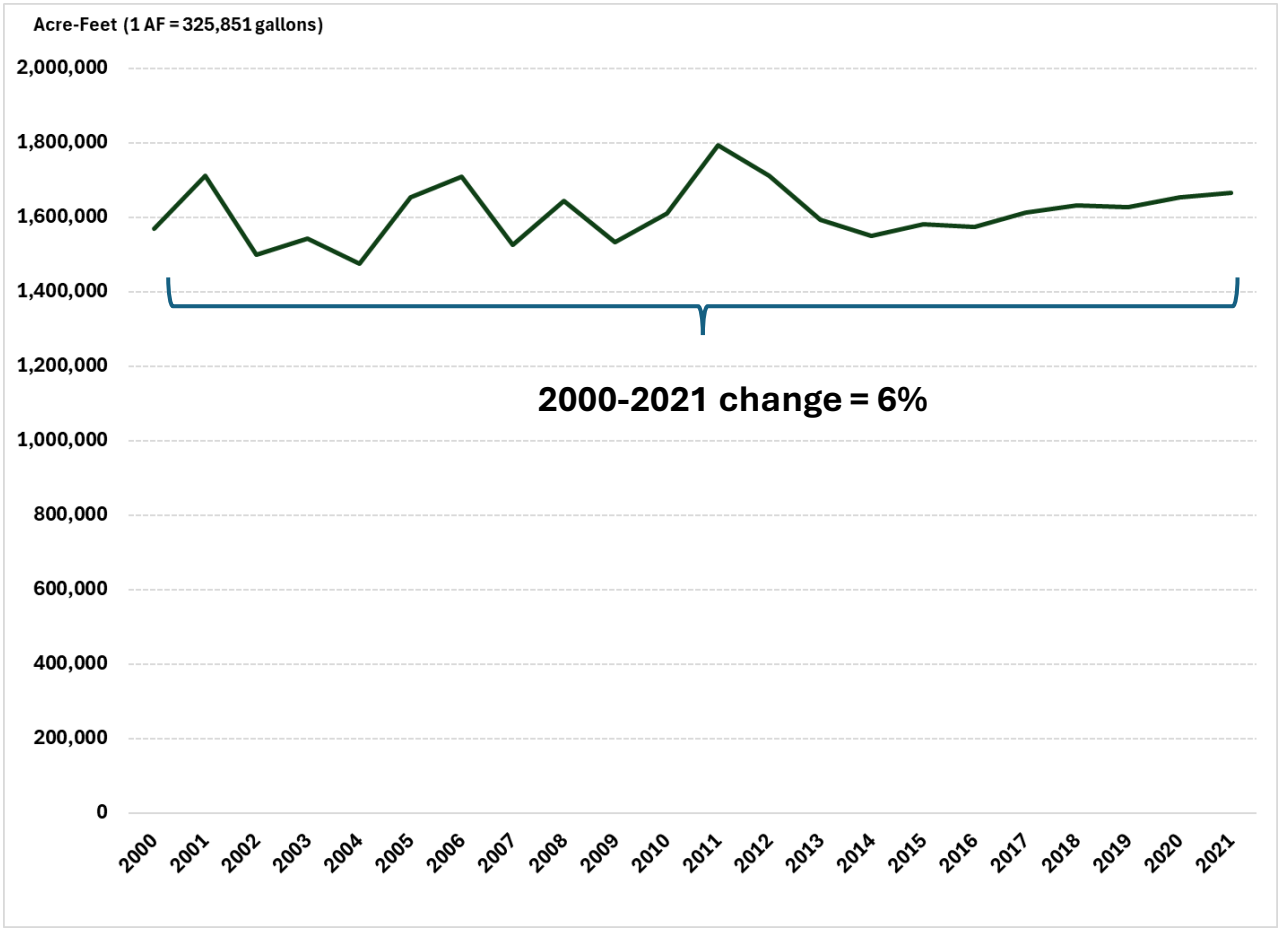


Source: ERCOT, Author's Analysis

2000-2021 Population Change: 29%

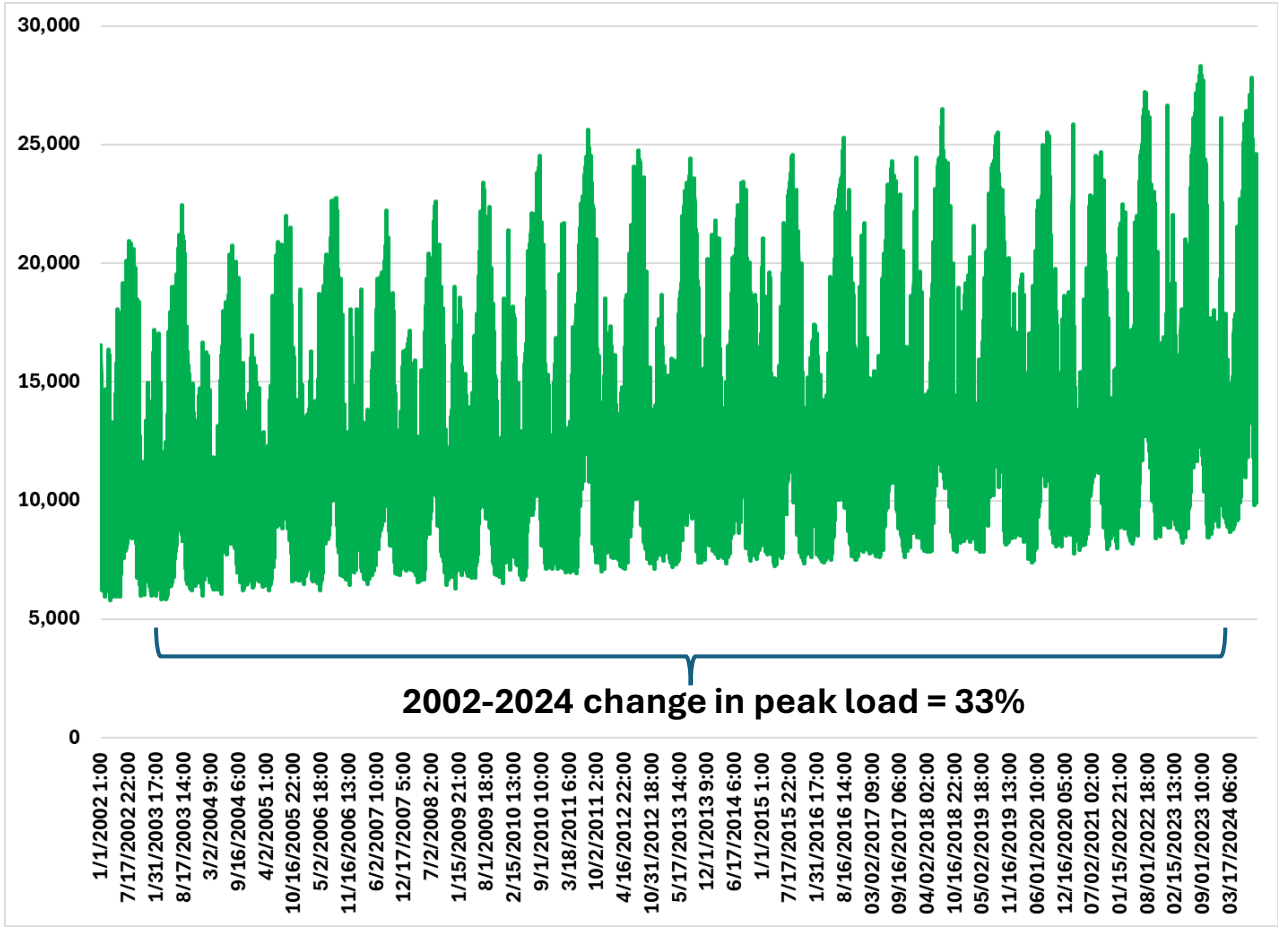
North-Central Load Zone

Annual Water Use, AF



Source: TWDB, Author's Analysis

Hourly Electricity Load, MW

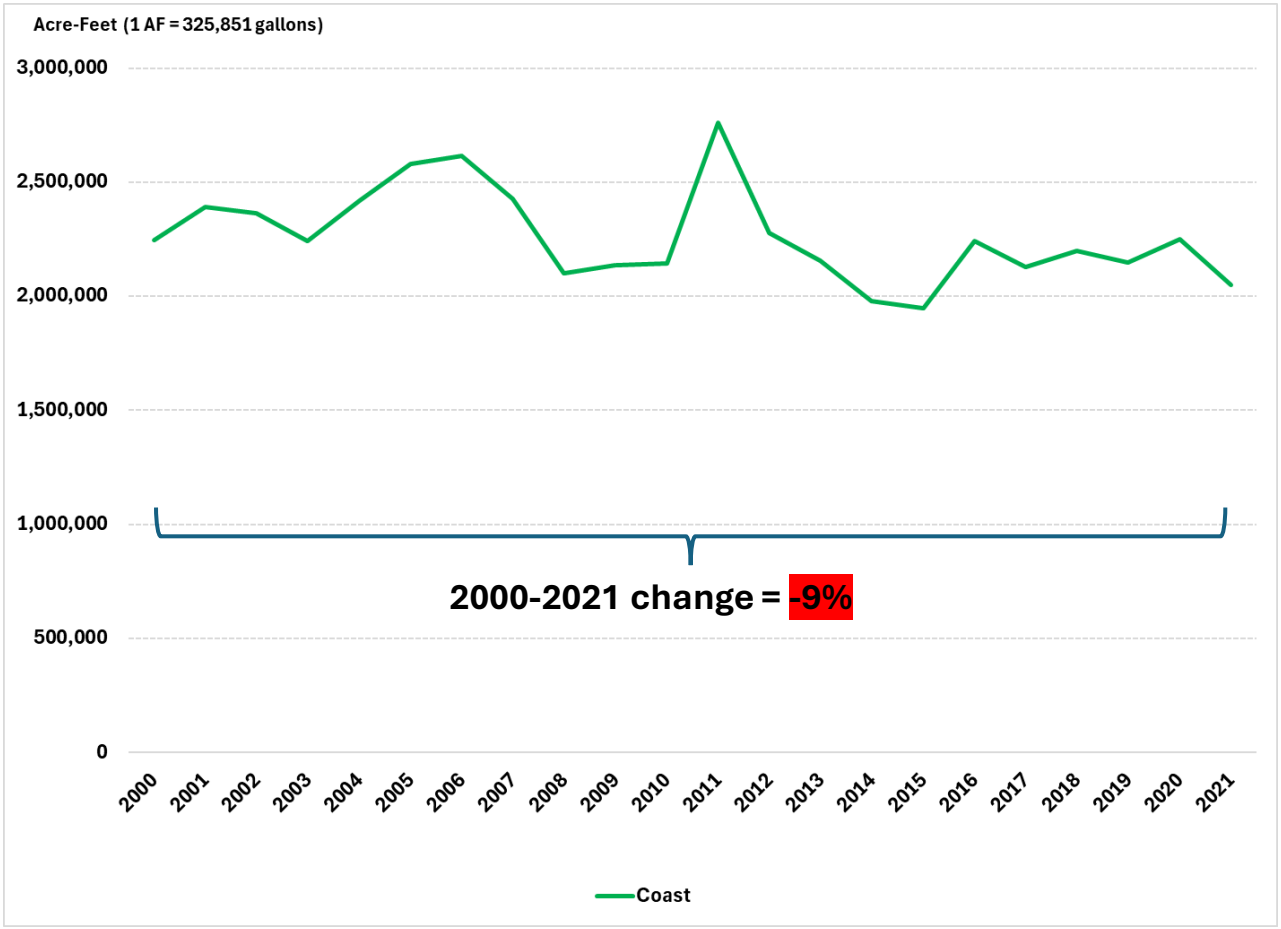


Source: ERCOT, Author's Analysis

2000-2021 Population Change: 48%

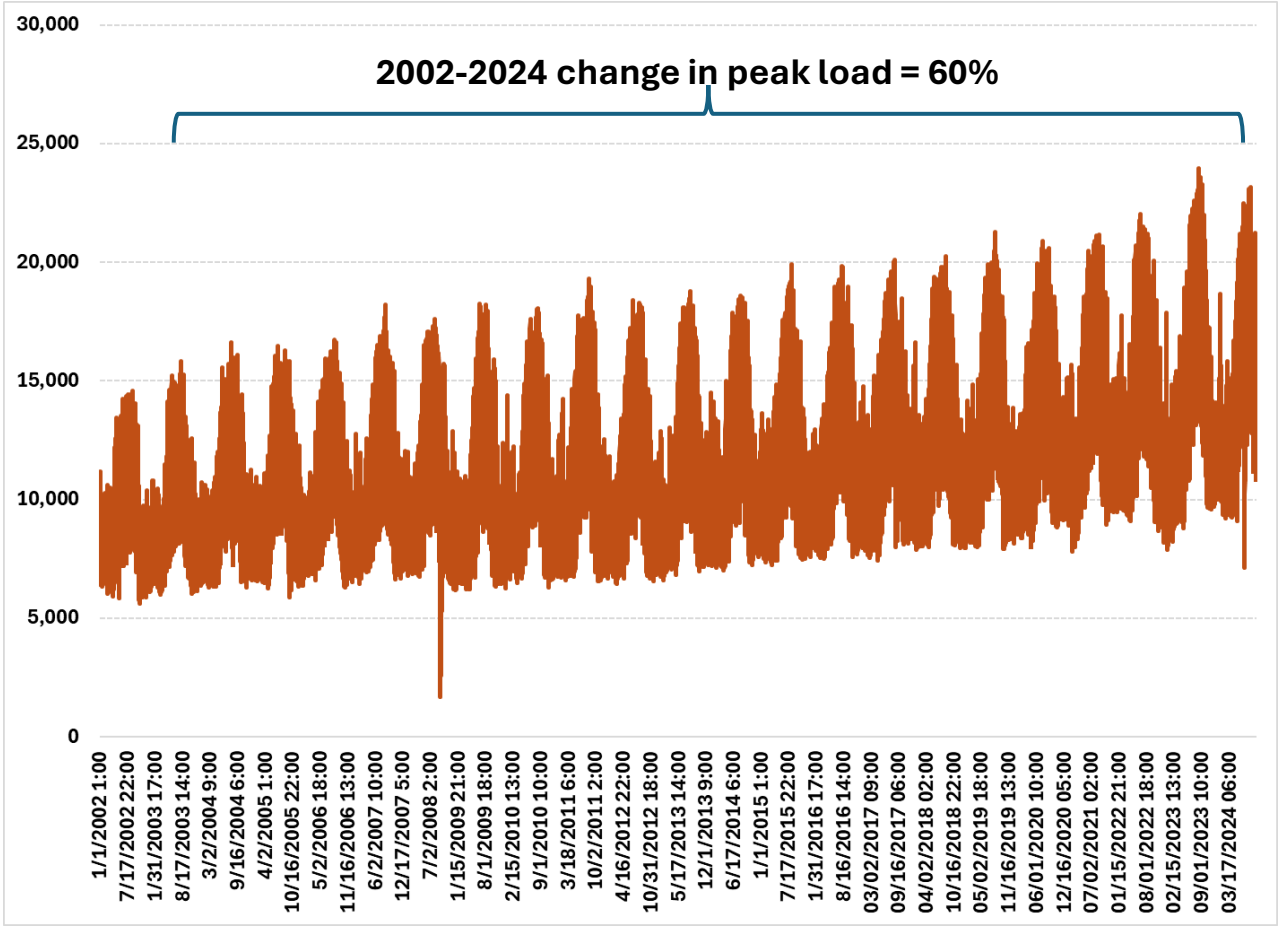
Coast Load Zone

Annual Water Use, AF



Source: TWDB, Author's Analysis

Hourly Electricity Load, MW



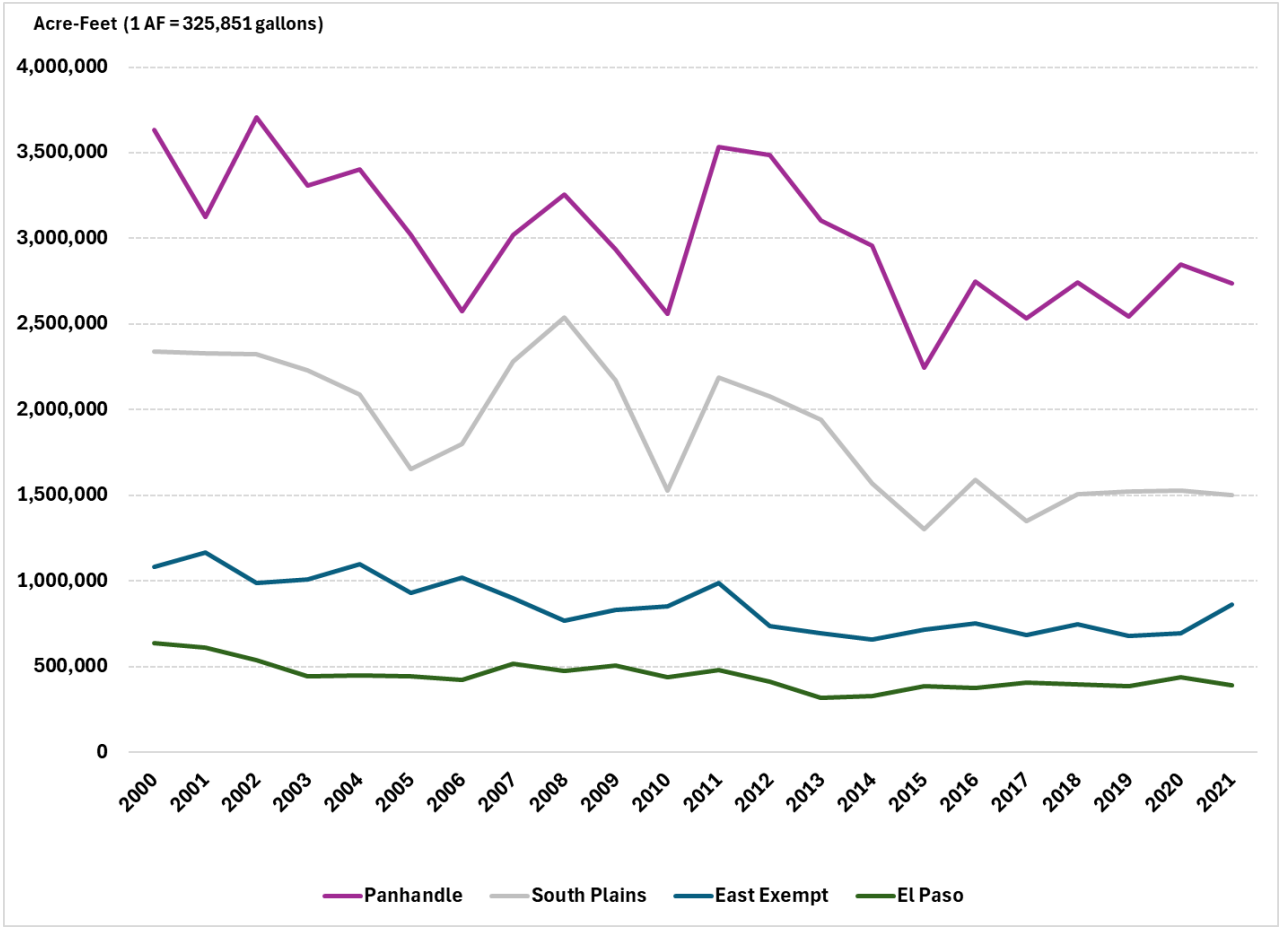
Source: ERCOT, Author's Analysis

2000-2021 Population Change: 51%

Counties Outside the ERCOT Reported Weather Zones

- El Paso, Panhandle, South Plains, Far East Texas.
- These are generally lower population, lower growth areas.
- El Paso is an exception.
- The Panhandle and South Plains are historically high-water use areas. Water demand in them is declining over time as farmers respond to serious depletion of the Ogallala Aquifer.
- Note that I do not presently have detailed electricity load data for these areas. I will work to obtain this. I have located a high-frequency source for the El Paso area.

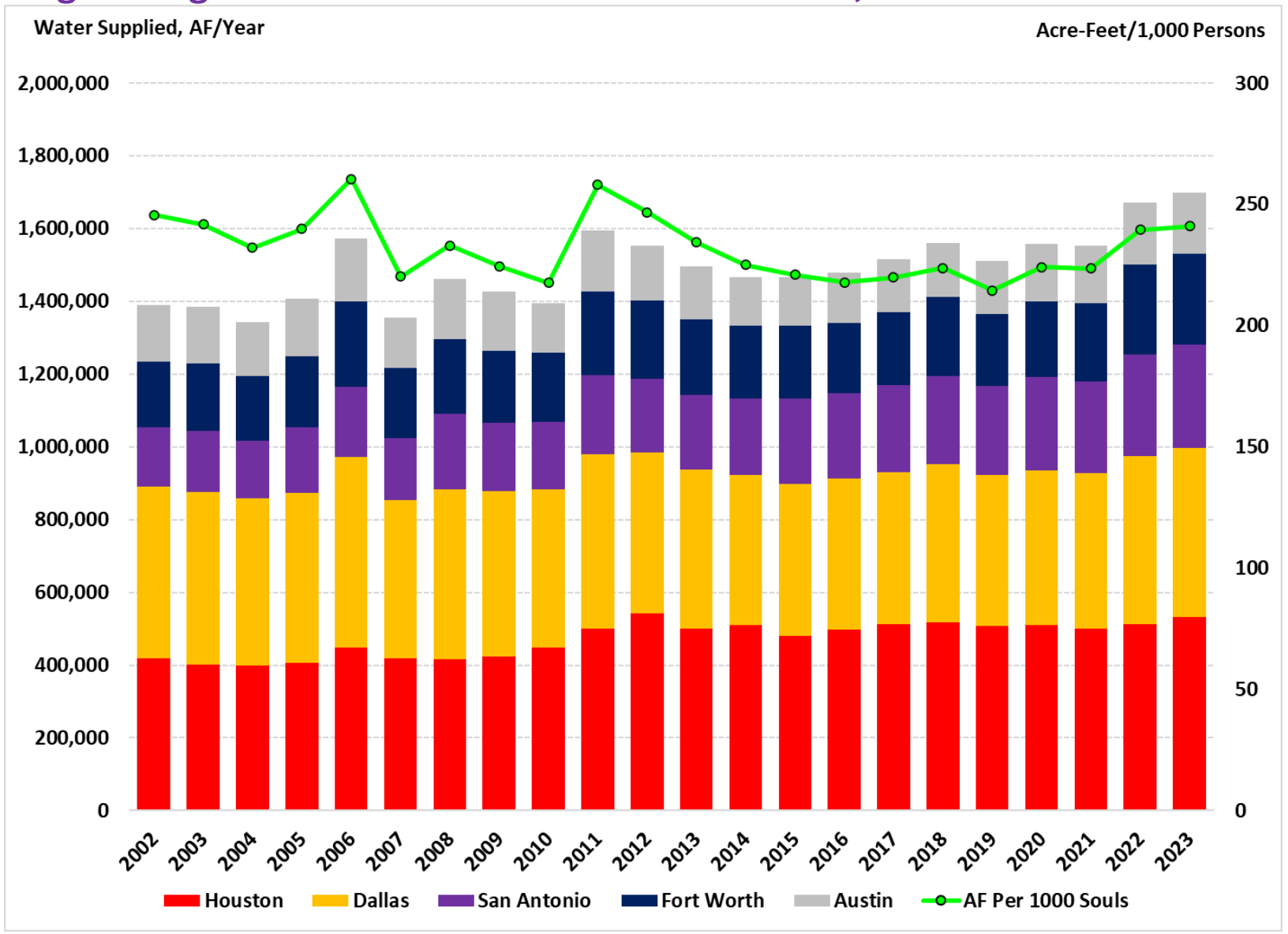
Annual Water Use, AF



Source: TWDB, Author's Analysis

Water Use: Looking Beyond 2021

Large Triangle Cities' Estimated Annual Water Use, 2002-2023



- In the four largest Triangle cities (which are the 4 largest in Texas and are home to more than 7 million people), water volumes supplied rose meaningfully in Fiscal 2022 and 2023.
- This is interesting because the 2022 and 2023 calendar years also saw substantial increases in peak electricity load throughout ERCOT.
- As 2022 and 2023 statewide water data become available, we will need to run a broader analysis.
- 2022 and 2023 potentially represent a step change in per capita water intensity for the biggest Texas metros, reaching levels not seen for a decade.

Source: Comprehensive Annual Financial Reports, Author's Analysis

Conclusions

- Water and electricity are two of the four pillars of the Texas growth model (the others being governance and human capital), and thus merit close observation by policymakers.
- Most of the Load Zones in Texas saw water use decrease between 2000 and 2021, the last year for which TWDB data are available.
- It is possible that water use and power use are structurally diverging as Texas grows and becomes less agrarian.
- This hypothesis would be supported by the fact that irrigated farming requires tremendous amounts of water and because electricity is perhaps the ultimate climate volatility adaptation commodity in a state where A/C matter sin the summer and more than 60% of homes utilize electric heating in the winter.
- I'll further test the hypothesis over time.
- As 2022 and 2023 statewide water data become available, I will repeat the zonal analysis to see if water use also grew alongside electricity usage or if it has structurally diverged.