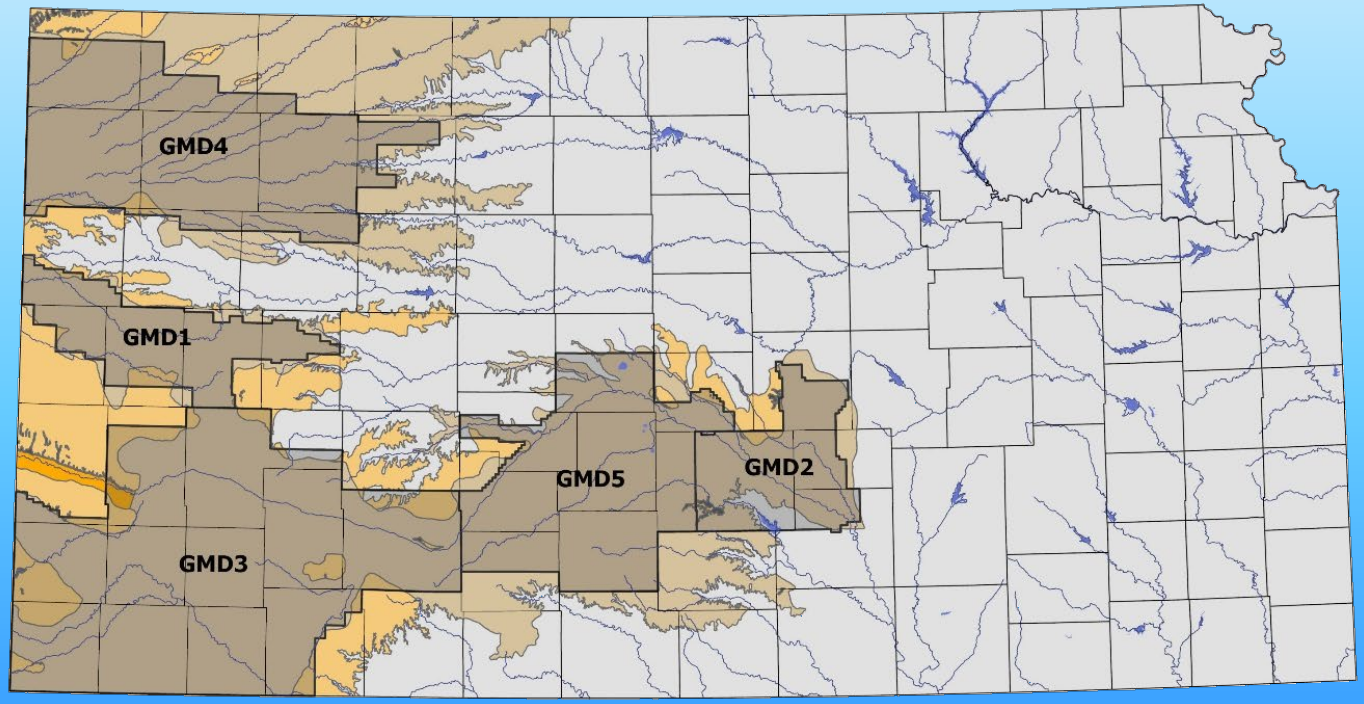
STATUS OF THE HIGH PLAINS AQUIFER IN KANSAS



Governor's Water Conference – November 16, 2023

Don Whittemore, Jim Butler, and Brownie Wilson

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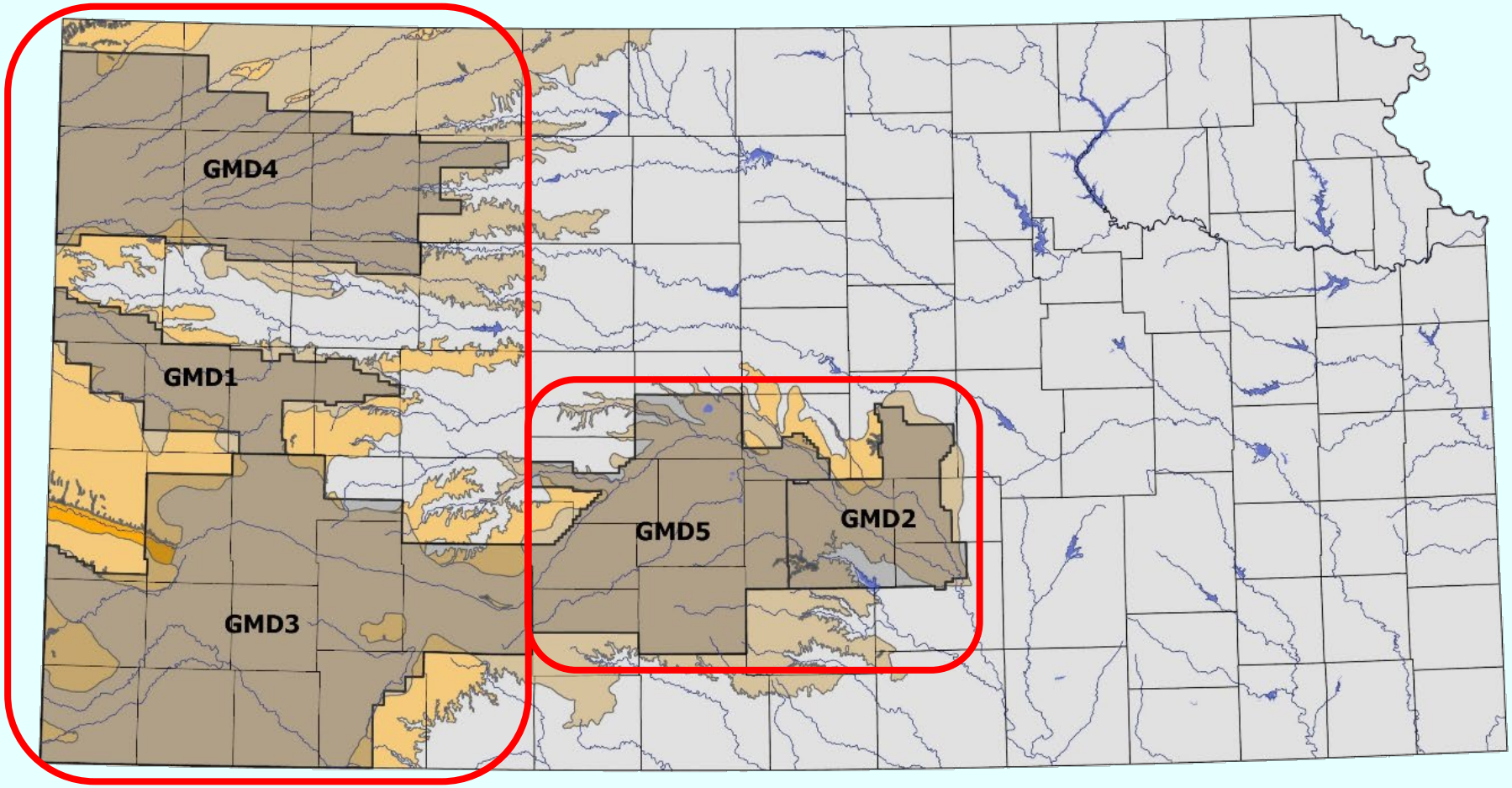
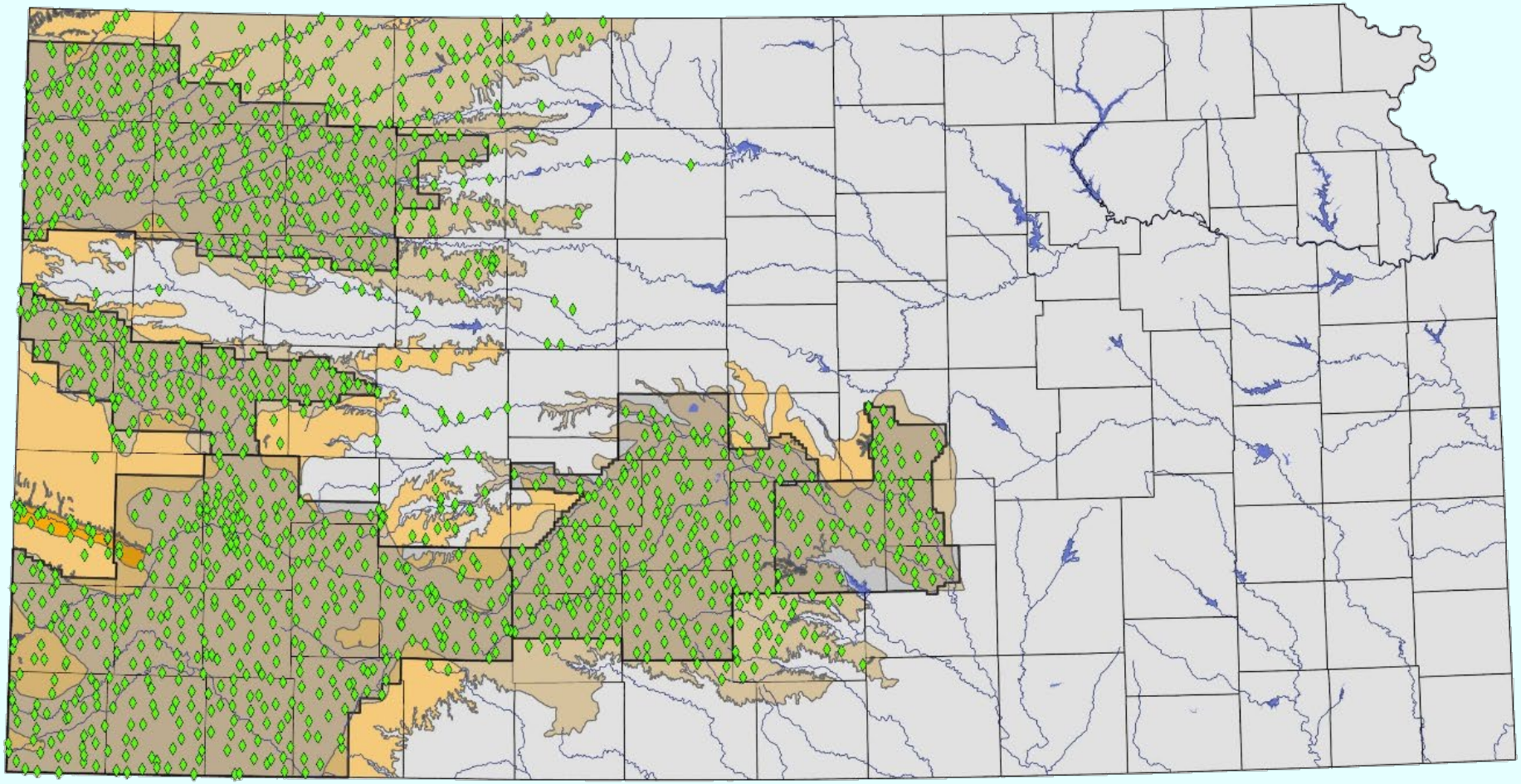
High Plains Aquifer Regions



Ogallala **Quaternary**

Locations of About 1,400 Wells Measured Each Winter by KGS and DWR



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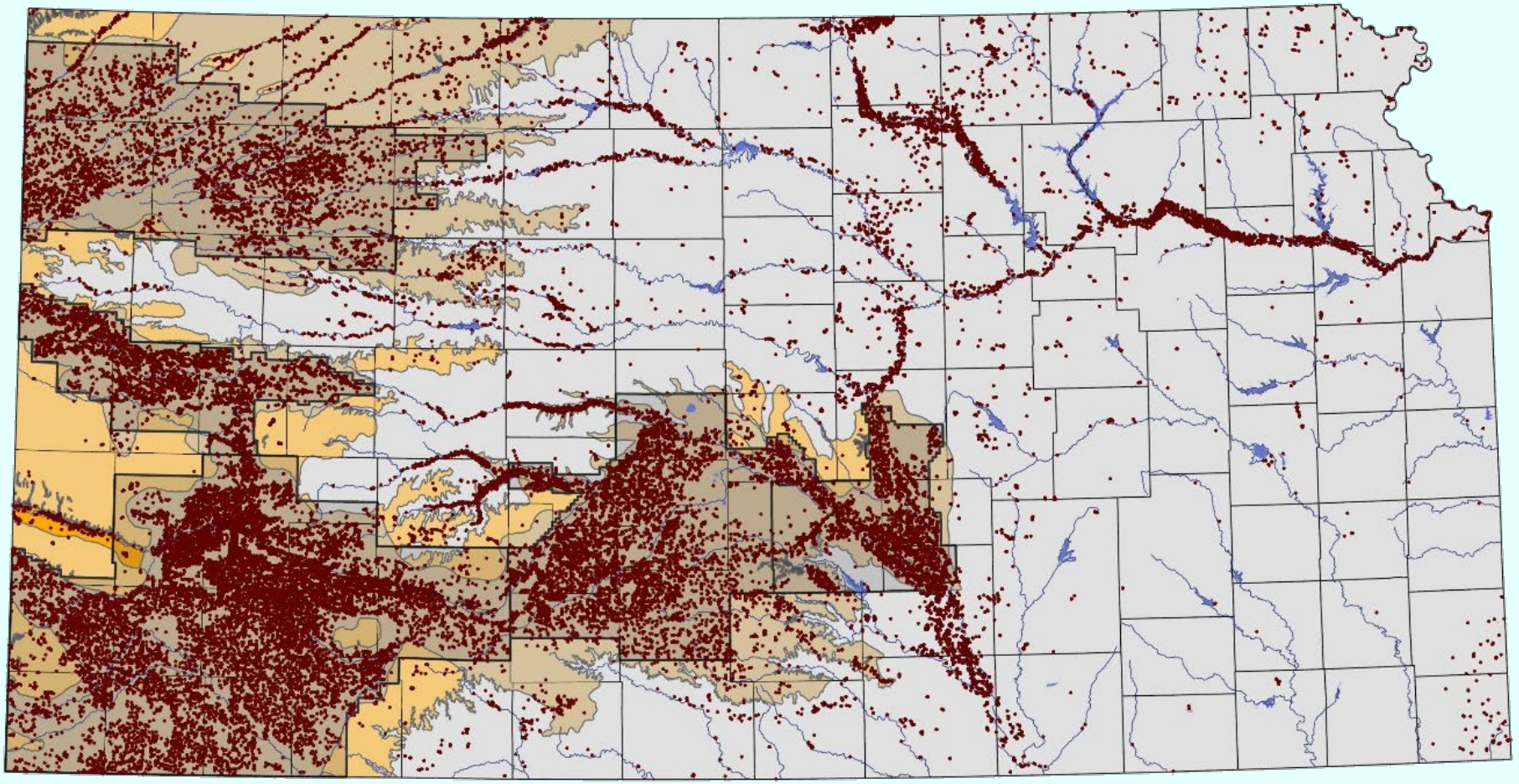
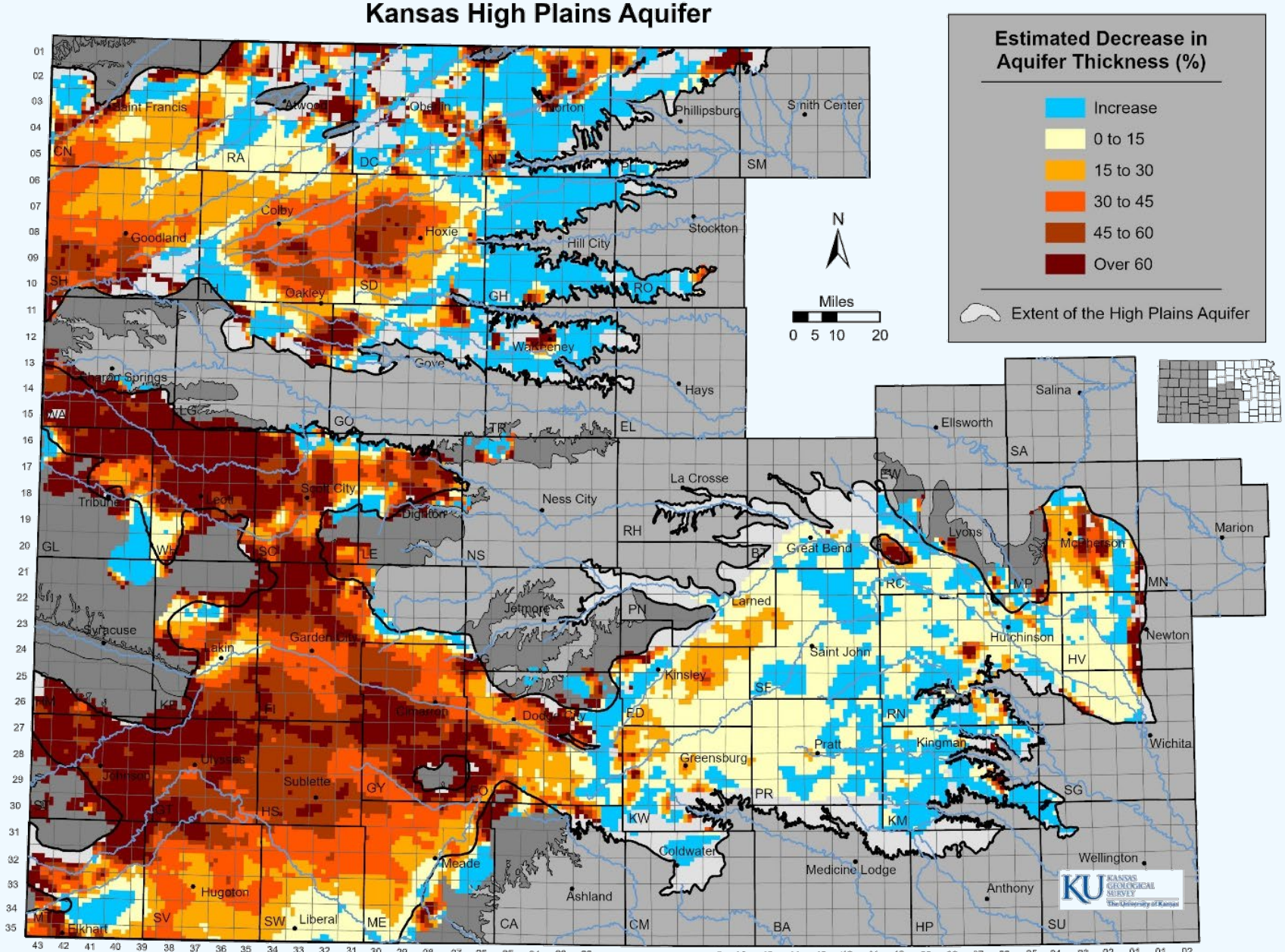
Locations of Wells with Water Rights



Percent Change in Aquifer Thickness, Predevelopment to Average 2021-2023, Kansas High Plains Aquifer



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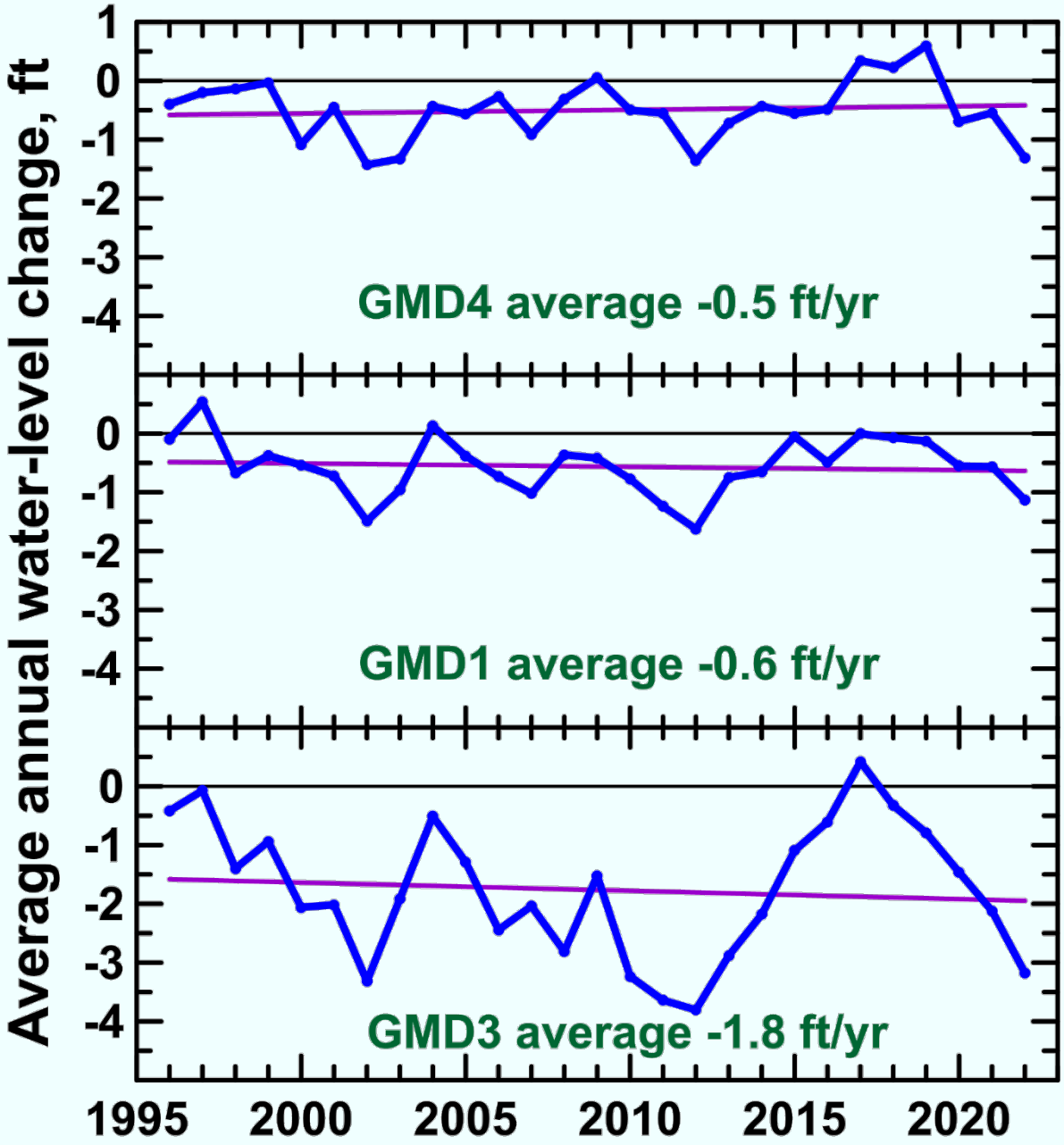
Status of Ogallala Region

Aquifer Changes from Predevelopment to 2023 and Aquifer Thickness Remaining

	GMD4	GMD1	GMD3
Water-level change to 2023, ft	-28	-51	-101
Aquifer thickness loss, %	25	61	45
Thickness remaining, ft	75	32	142



Average annual water-level change 1996–2022

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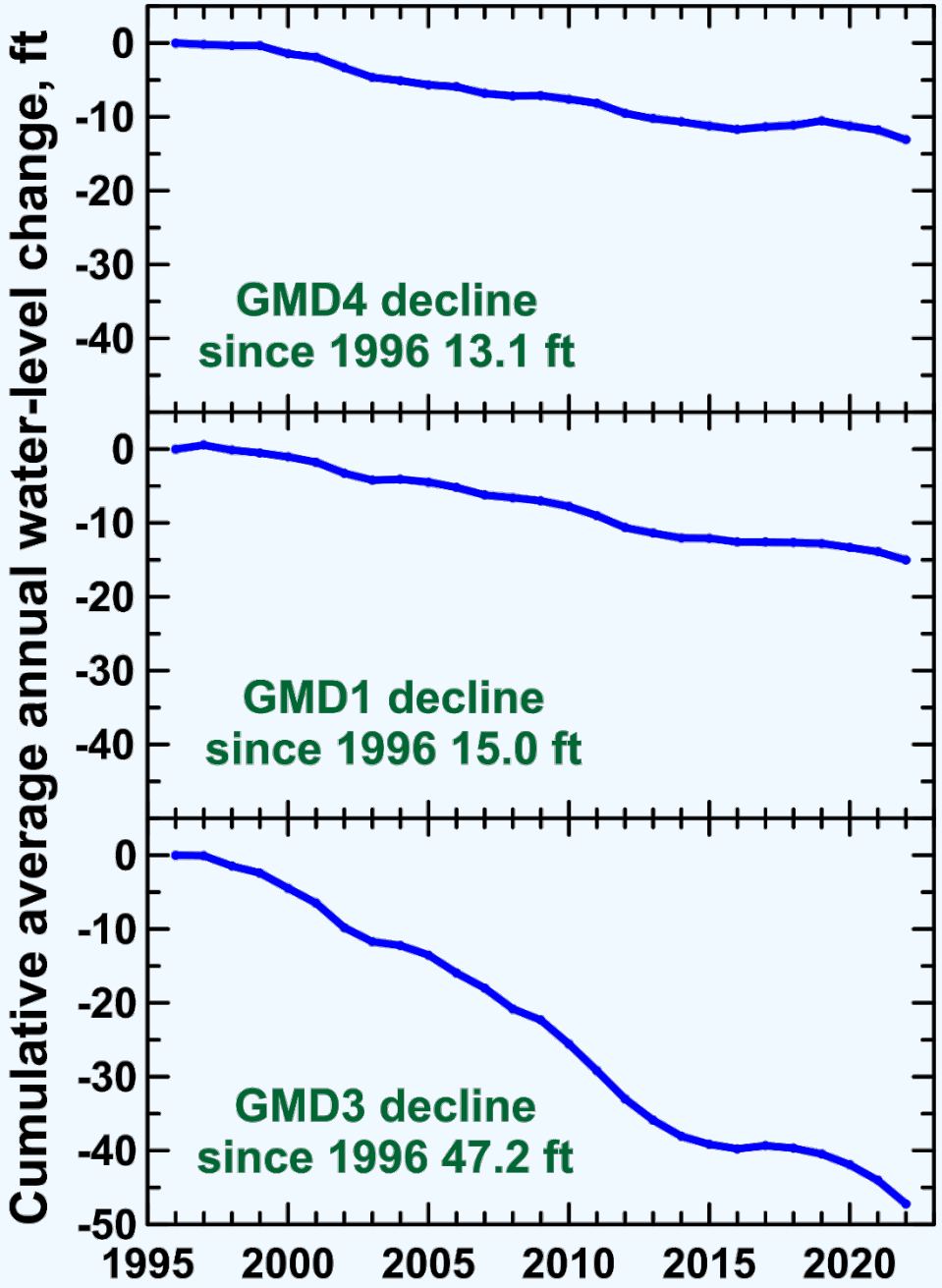

Cumulative change in average annual water levels 1996–2022

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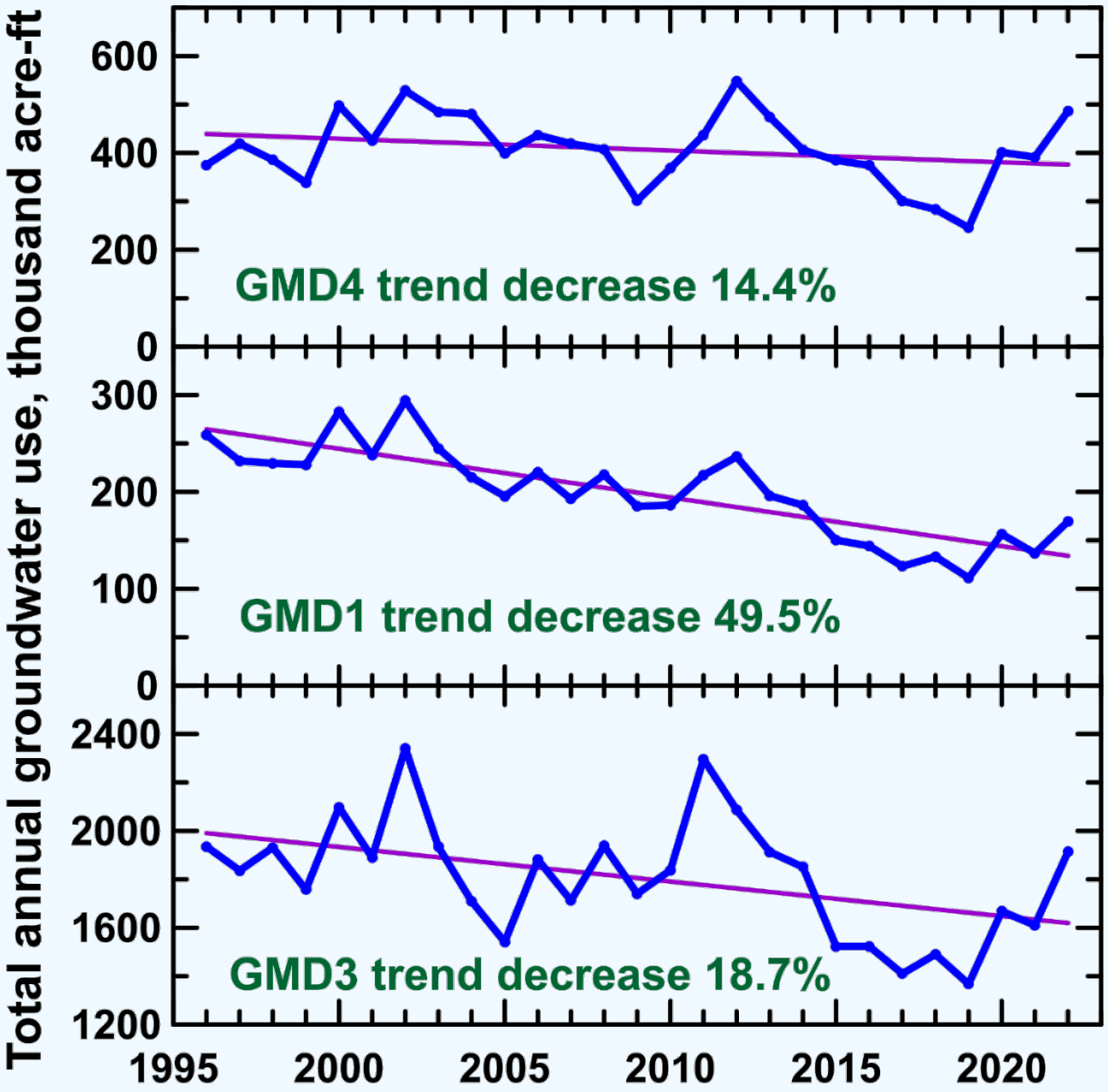

Total annual ground-water use 1996–2022

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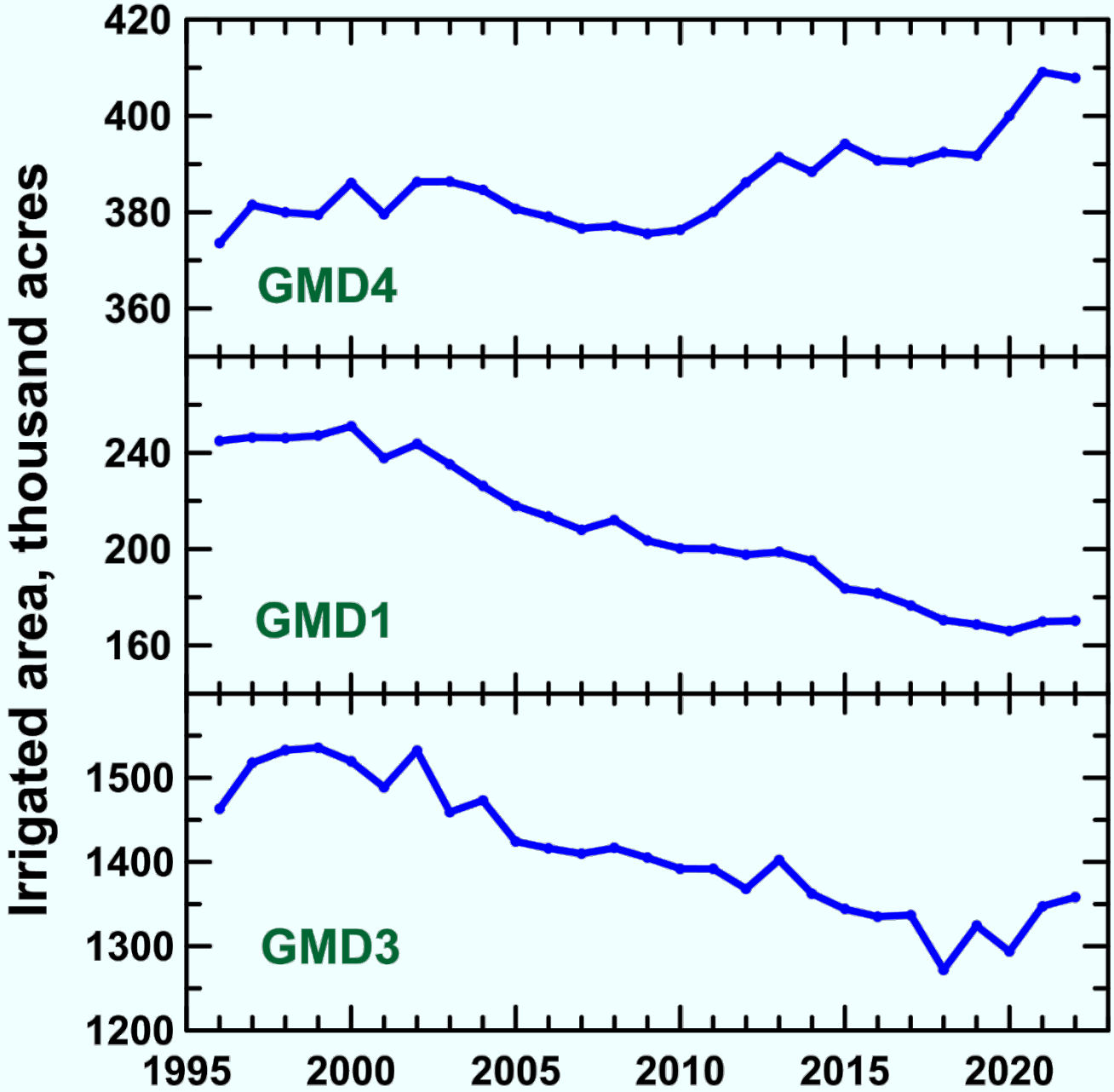
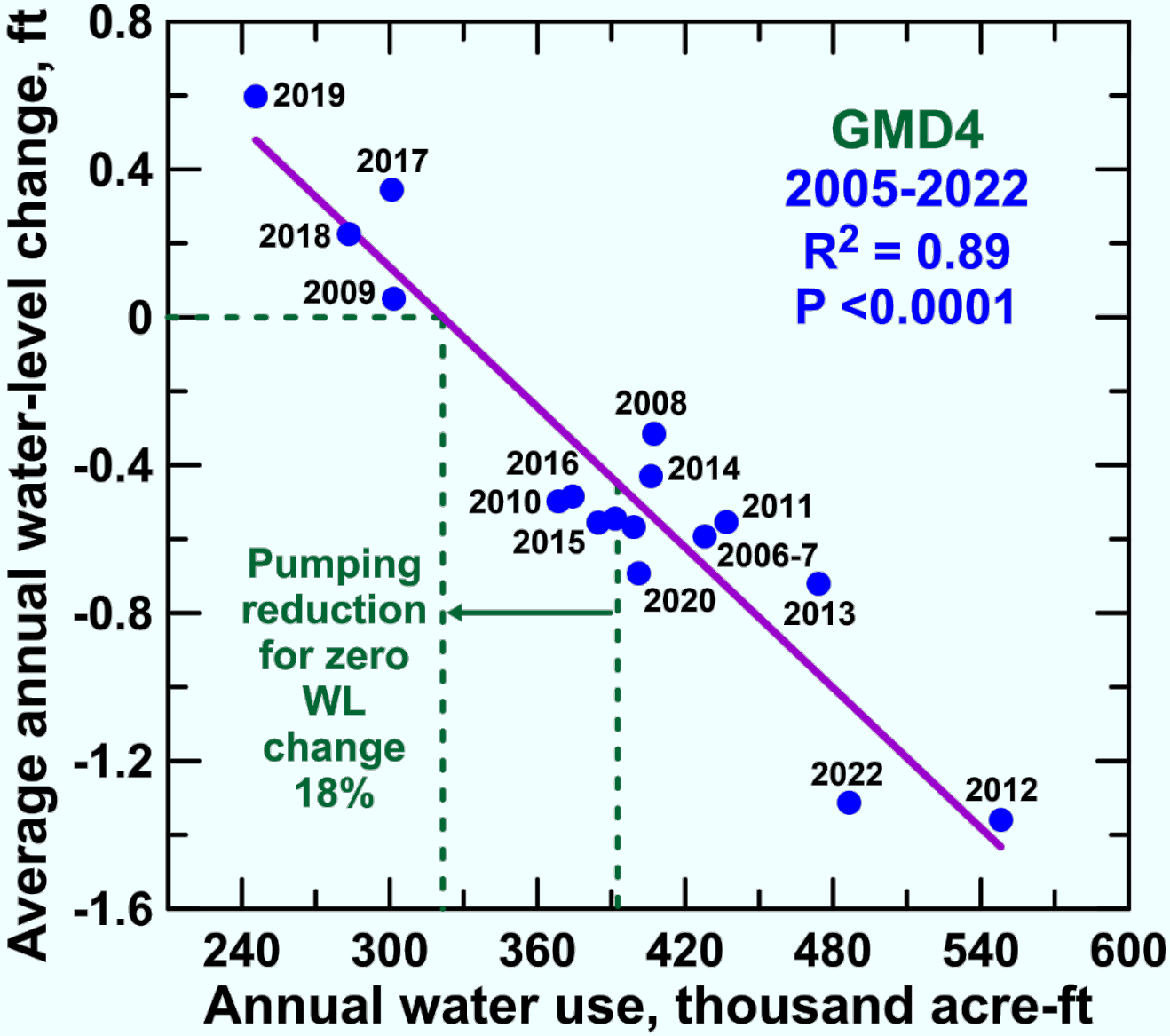


Annual irrigated acreage 1996–2022



GMD4 pumping reduction needed for stable water levels

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Pumping reductions needed for stable water levels based on plots similar to that for GMD4

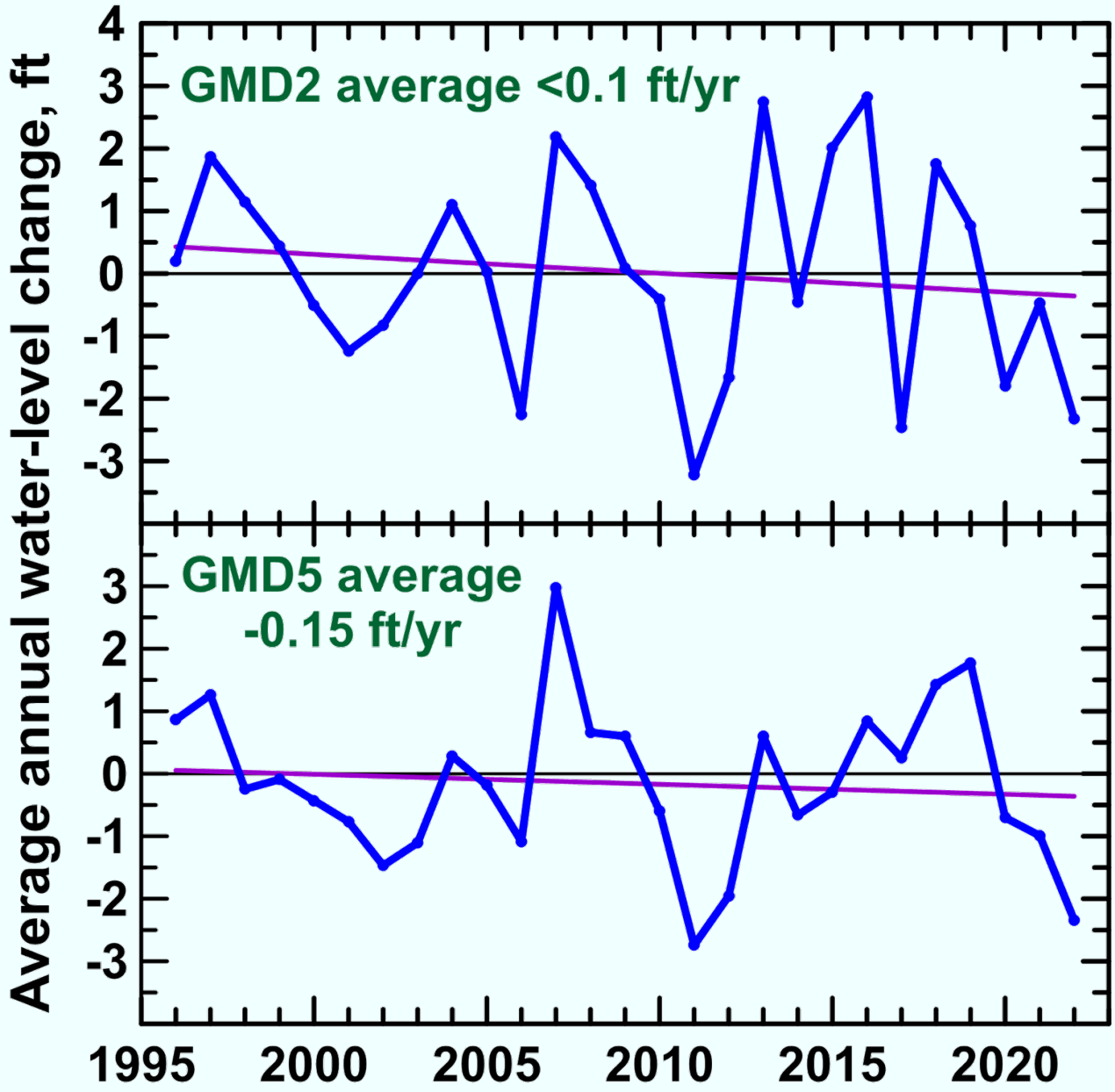
GMD1 32%

GMD3 25%

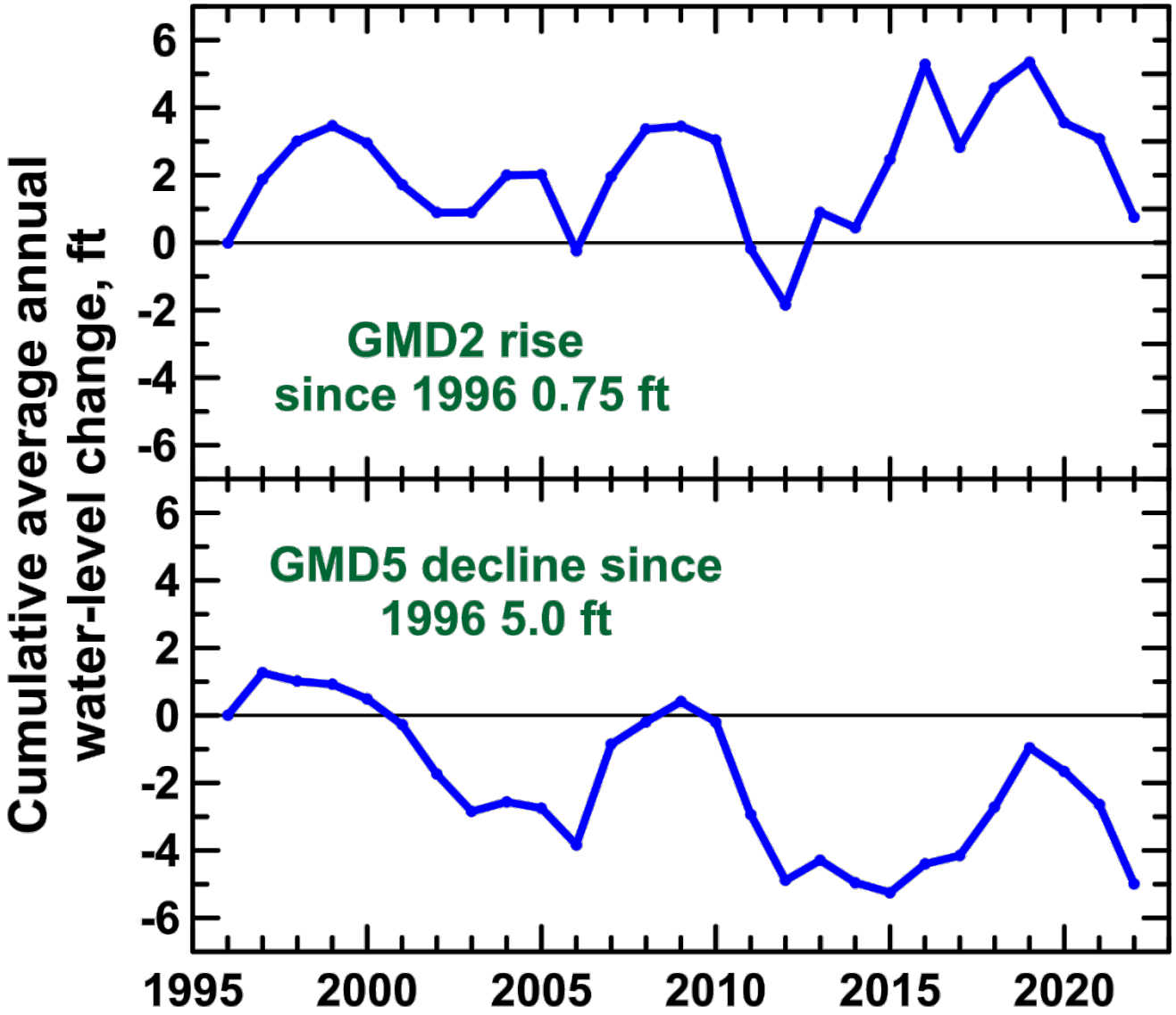
Status of Quaternary Region

Aquifer Changes from Predevelopment to 2023 and 1996–2023 and Aquifer Thickness Remaining

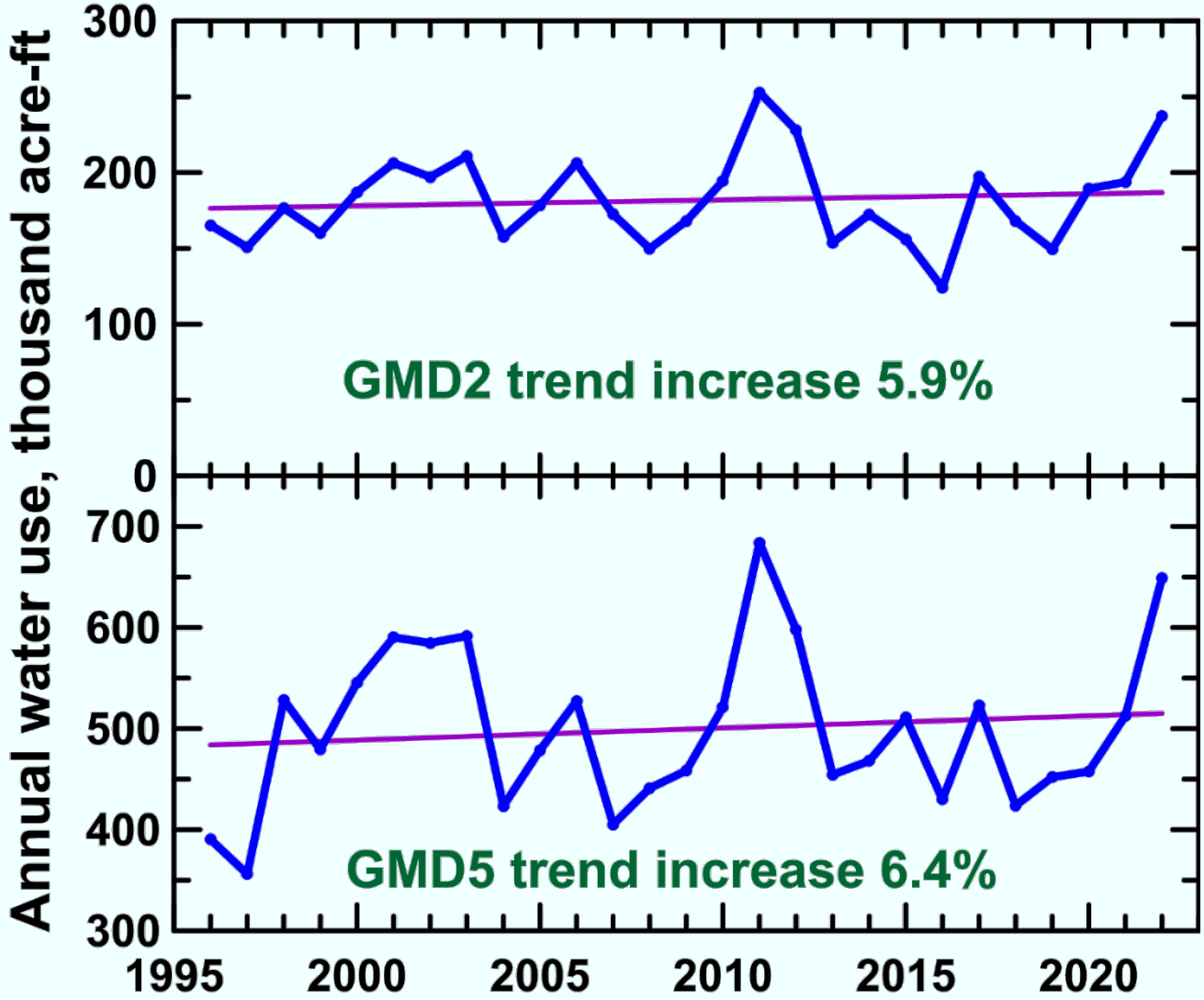
	GMD2	GMD5
Water-level change to 2023, ft	-6.9	-5.8
Water-level change 1996–2023	+0.8	-5.0
Thickness remaining, ft	94	116



Average annual water-level change 1996–2022



Cumulative change in average annual water levels 1996–2022



Total annual ground-water use 1996–2022

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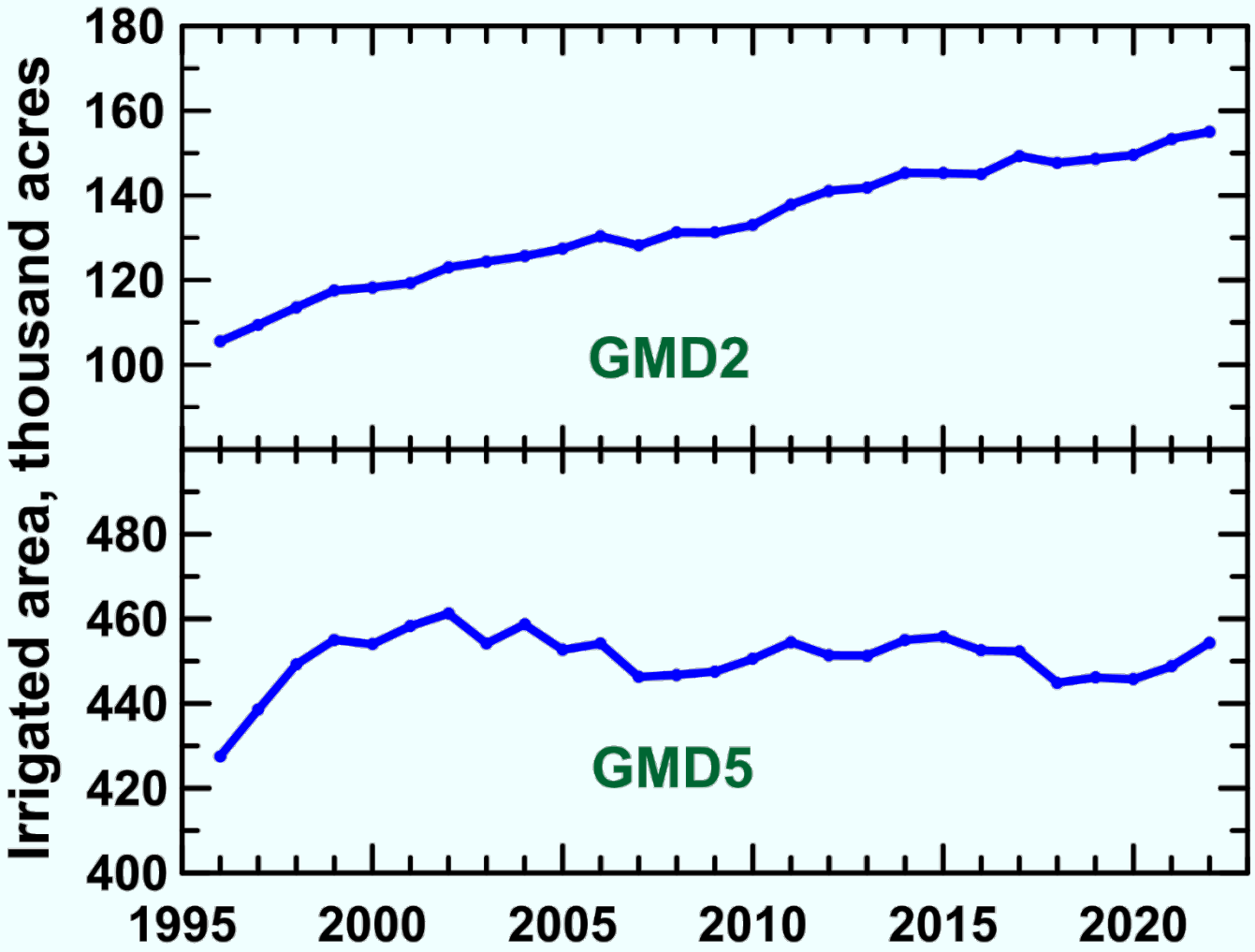
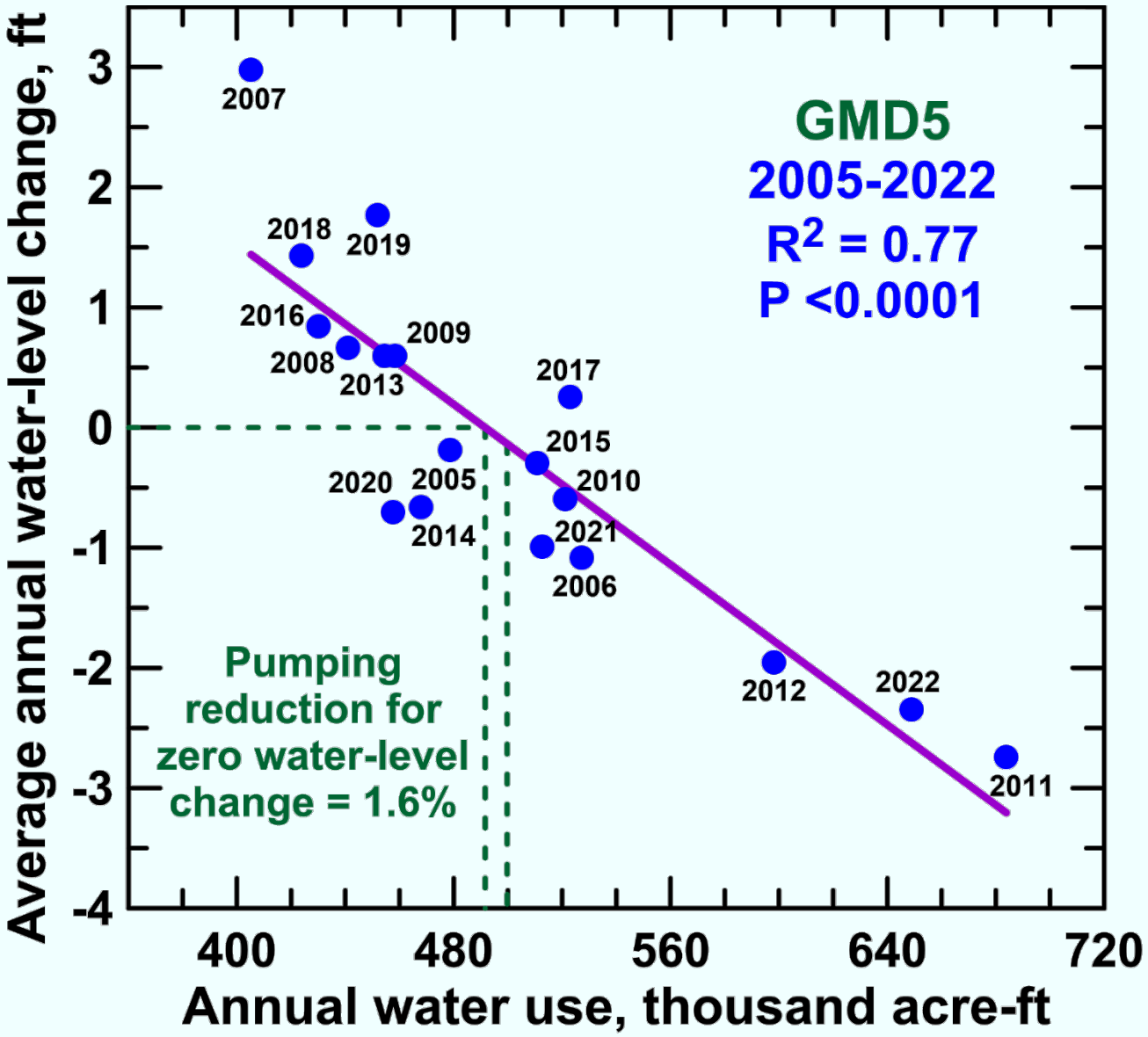


Annual irrigated acreage 1996–2022



GMD5 Pumping reduction needed for stable water levels

Change for GMD2 is +0.7%

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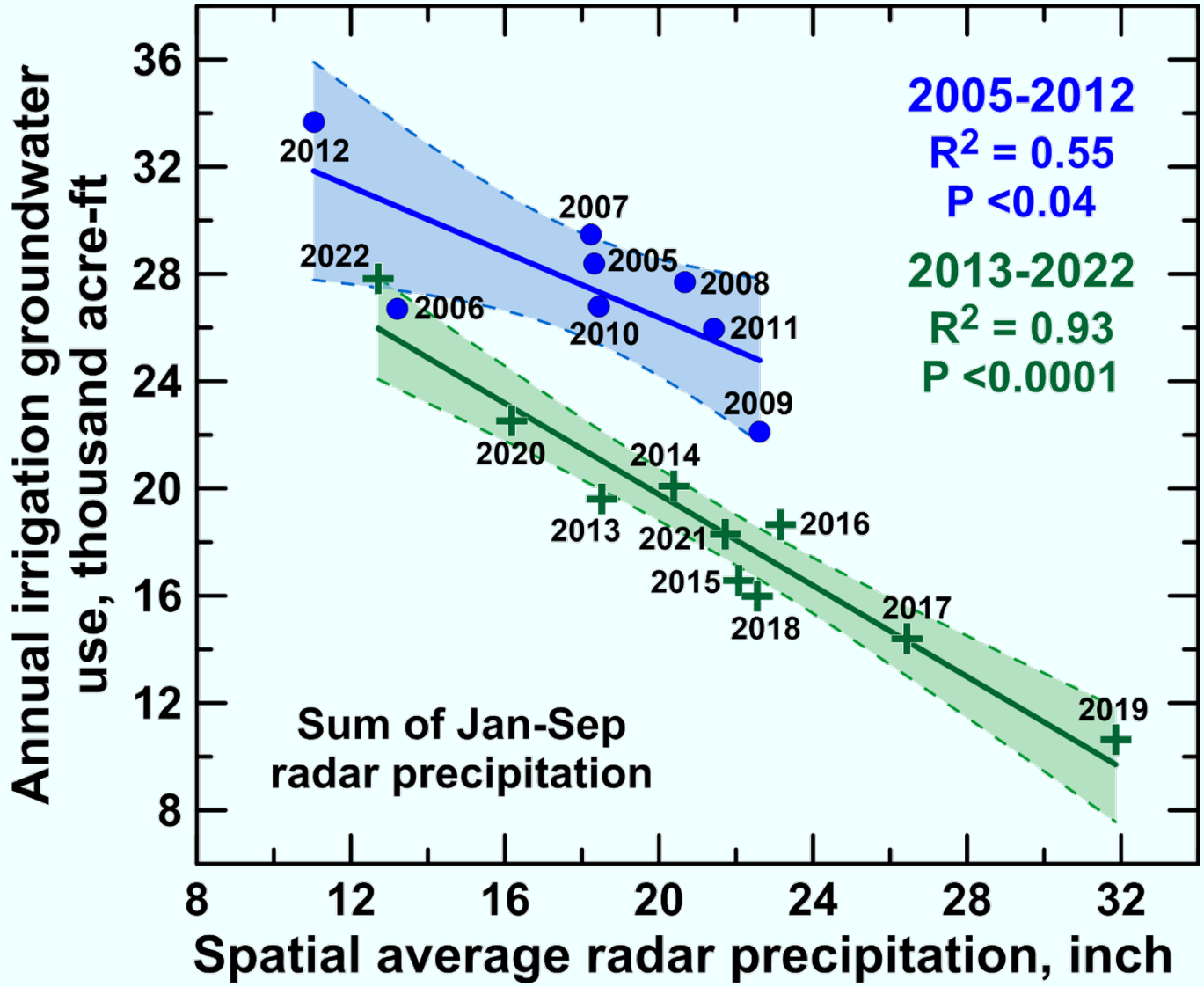
Has Irrigation Pumping Been Reduced?

Irrigation Groundwater Use Versus Precipitation

Water Savings in Sheridan-6 LEMA ~24.3%



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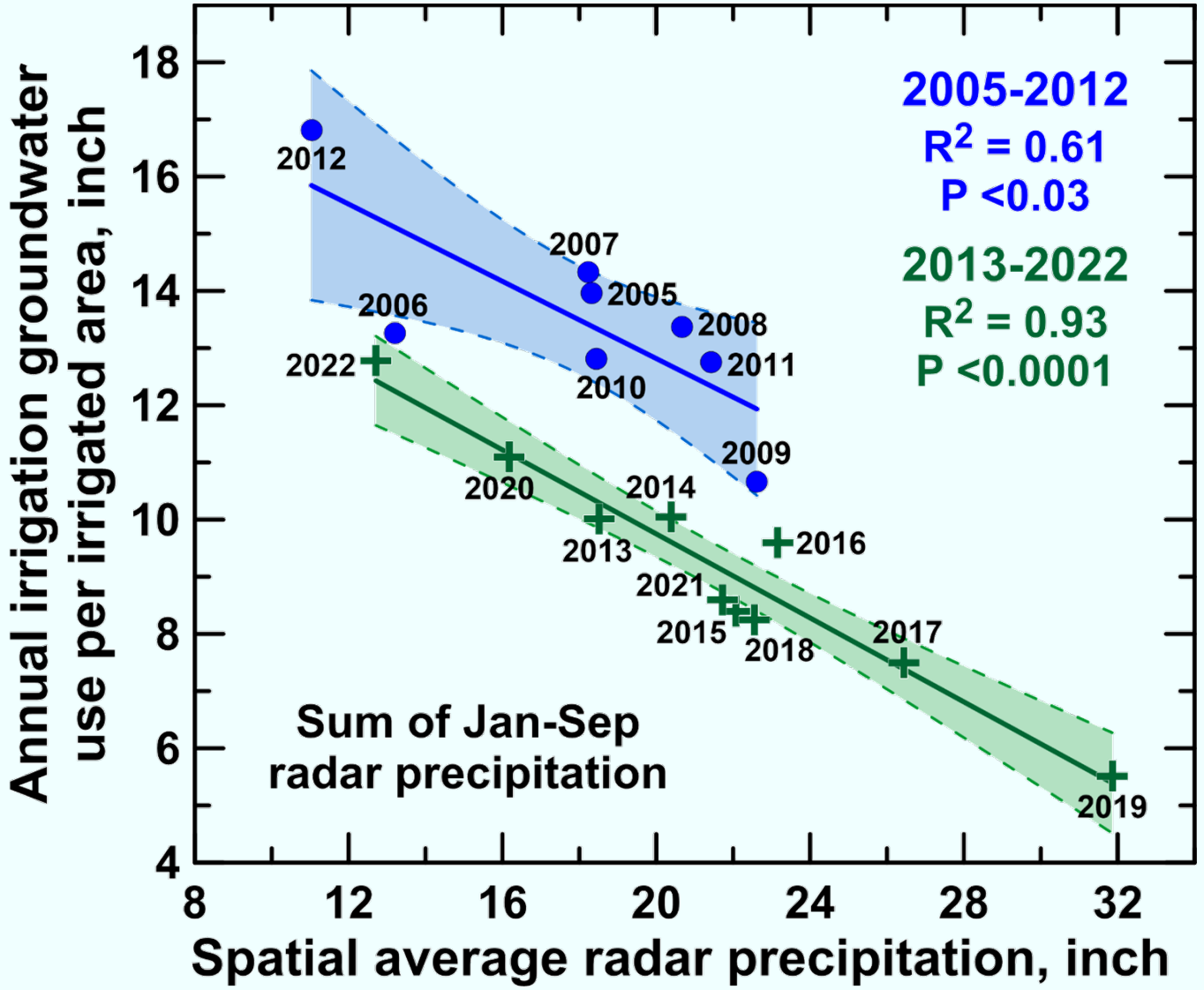
Irrigation Application Rate Versus Precipitation

Water Savings in Sheridan-6 LEMA ~23.5%



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Reduction in Irrigation Pumping and Application Rate in GMDs

GMD4: No statistically significant change in either

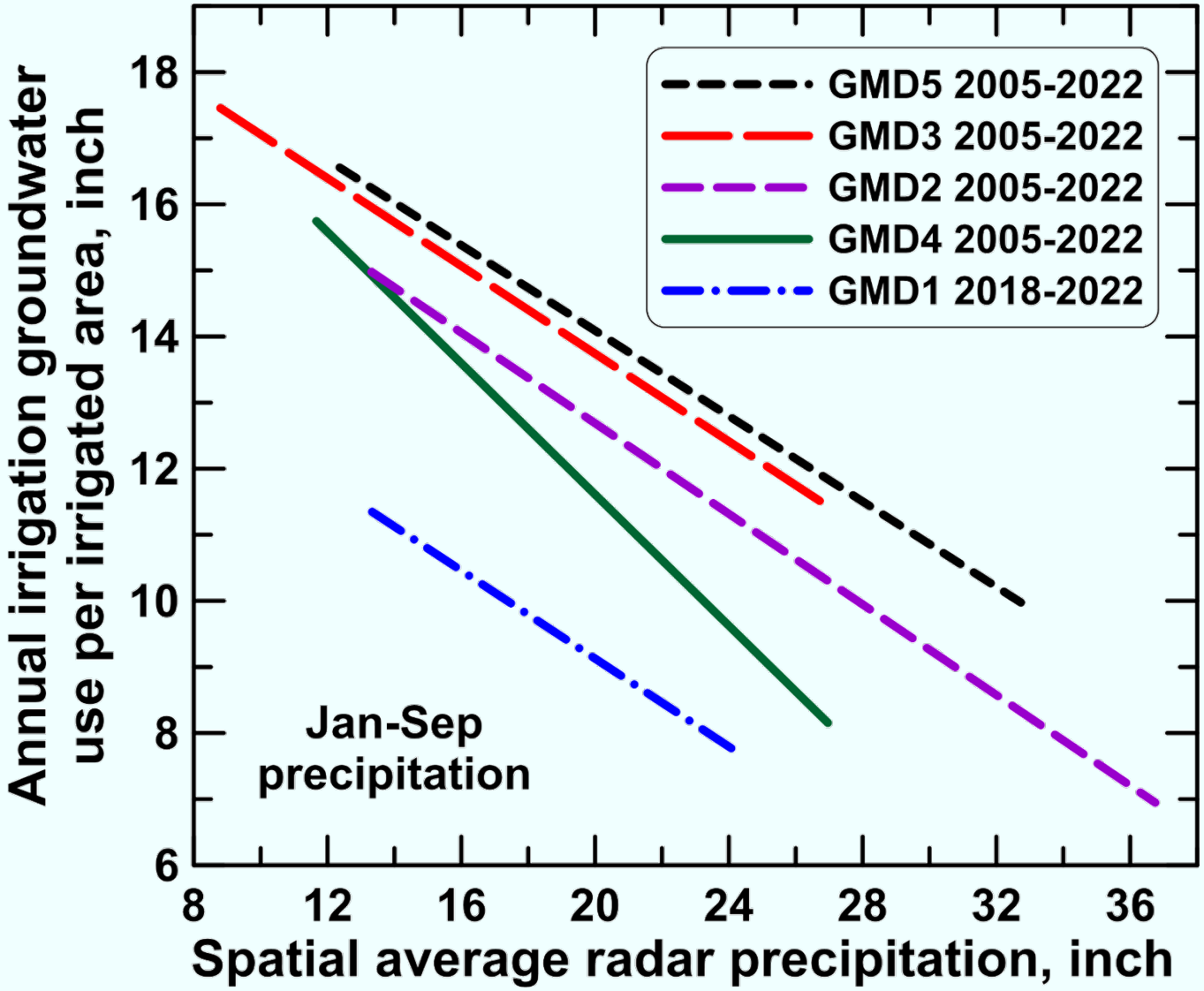
GMD1: Reduction of ~24% in pumping and ~10% in application rate during 2018–2022 compared to 2005–2017; difference is mainly due to decrease in irrigated area

GMD3: Reduction in pumping by nearly 13% during 2019–2022 compared to 2005–2018; No significant change in application rate

GMDs 2 & 5: No significant change in either

Irrigation Application Rate Versus Precipitation

Comparison of Best-Fit Lines for GMDs



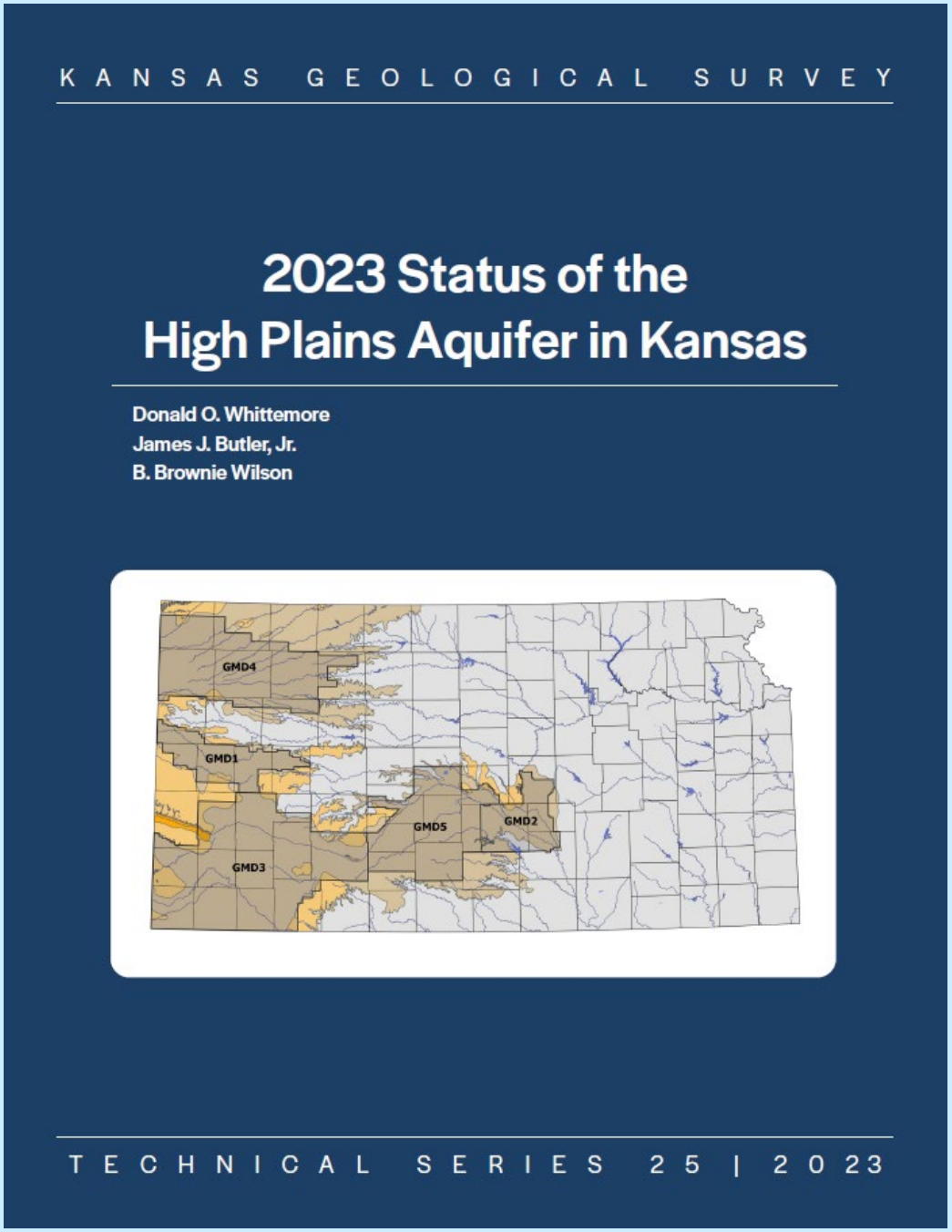
SUMMARY

Ogallala Region

- Water levels declined an average of 0.5–0.6 ft/yr in GMDs 1 and 4 and 1.8 ft/yr in GMD3 since 1996.
- Average pumping reductions to achieve stable water levels are 32% for GMD1, 25% for GMD3, 18% for GMD4.
- Conservation management has reduced irrigation pumping and application rates ~24% in the Sheridan-6 LEMA. Irrigation pumping has been reduced ~24% and application rate by ~10% in GMD1.

Quaternary Region

- Average water levels did not change significantly in GMD2 and declined 0.15 ft/yr in GMD5 since 1996.
- Average water levels are stable in GMD2 and pumping needs to be reduced by 1.6% in GMD5 for stability.



New KGS Publication

Free copies available at the KGS exhibit table

Acknowledgements

Kansas Water Plan

John Woods

Julie Tollefson