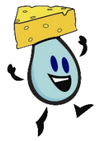
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Comparison of Wisconsin Water Withdrawals to USGS National Water Use Estimates from 2011 to 2020

2/7/2024| DNR.WI.GOV



DRINKING WATER & GROUNDWATER PROGRAM

What Are We Comparing?

- USGS Water Use Reanalysis is directly comparable to the reporting WDNR collects
- This analysis is a first cut at understanding the similarities and differences between estimates and reporting

USGS Water Use Reanalysis

- Released in 2023
- Estimates irrigation, public supply, thermoelectric water use
  - National dataset
  - HUC 12 (subwatershed) spatial resolution
  - Monthly time resolution
- Use modelling and machine learning

WDNR Water Use Reporting

- Reported to WDNR annually by water users
- Covers 13 water use categories
  - Statewide dataset
  - Source specific spatial resolution
  - Monthly time resolution

Initial Questions

- Do the estimates show similar volumes to Wisconsin reporting?
- Are the USGS estimates spatially consistent with reporting?
- Do the estimates show the same seasonal trends?
- Are estimates for some parts of the state more similar to reporting than other parts of the state?

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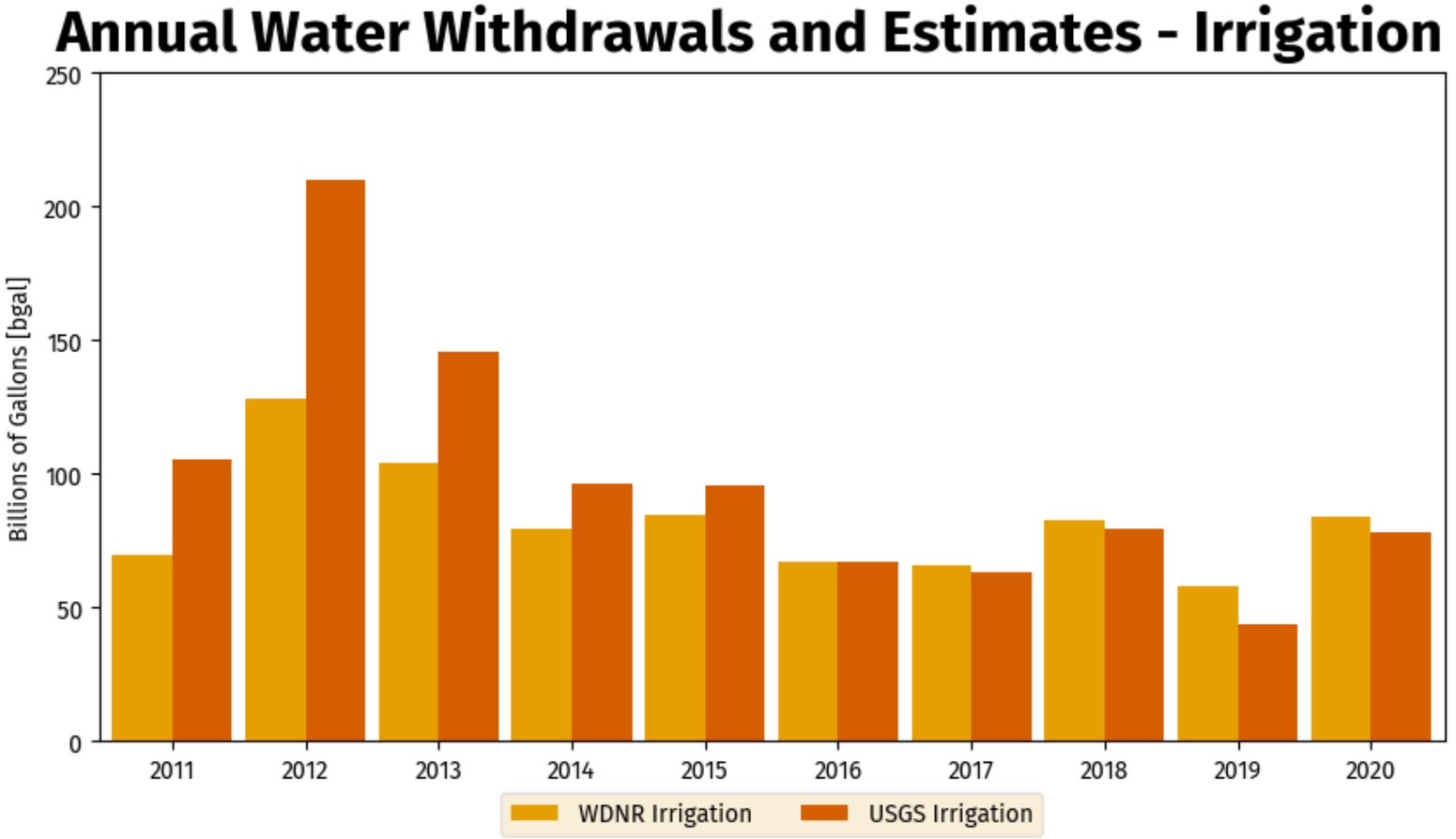
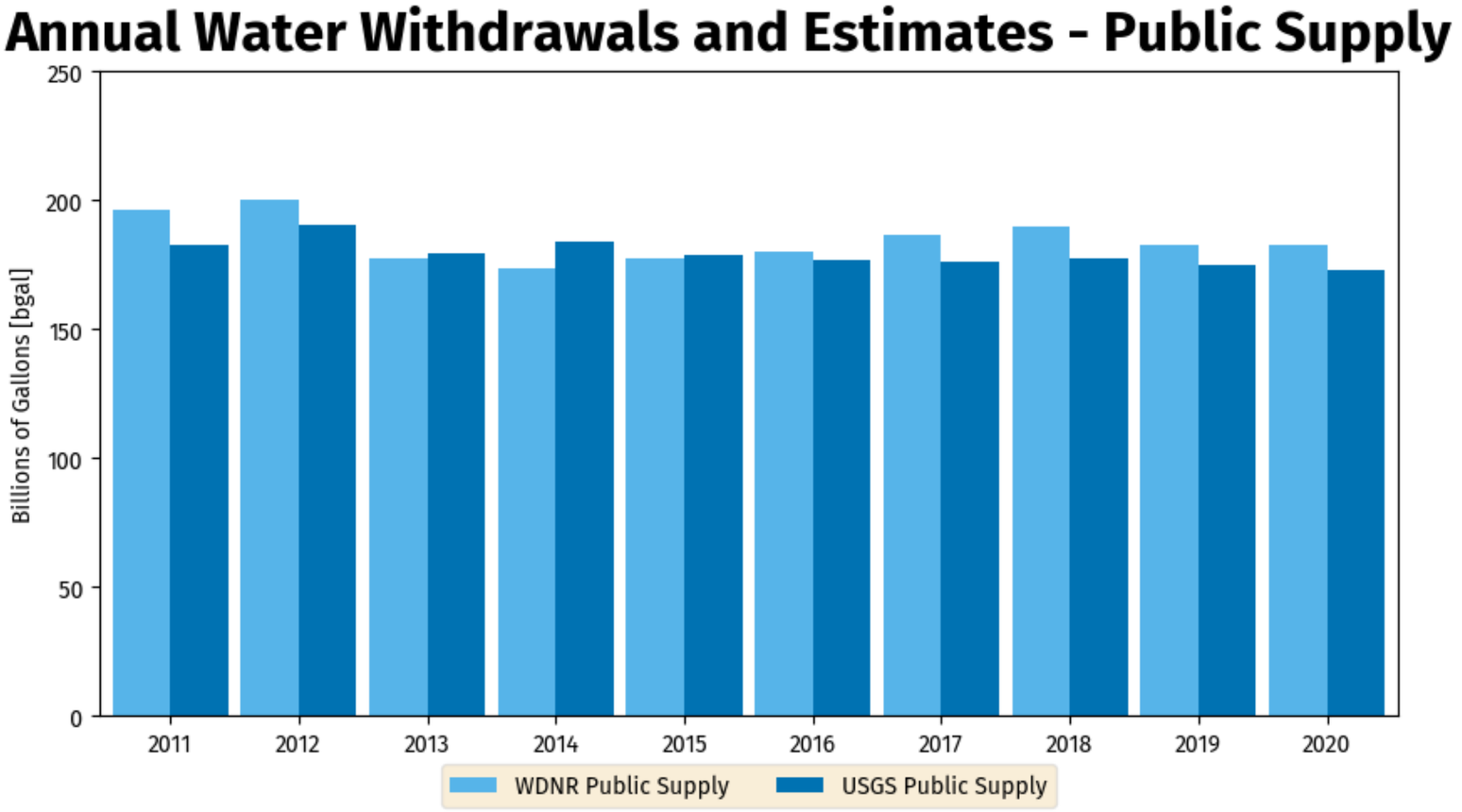
Volumes of USGS Estimates

- Irrigation is similar between 2011-2013
- USGS estimates generally underestimate surface water volumes
- Irrigation differs by ~16 billion gallons annually



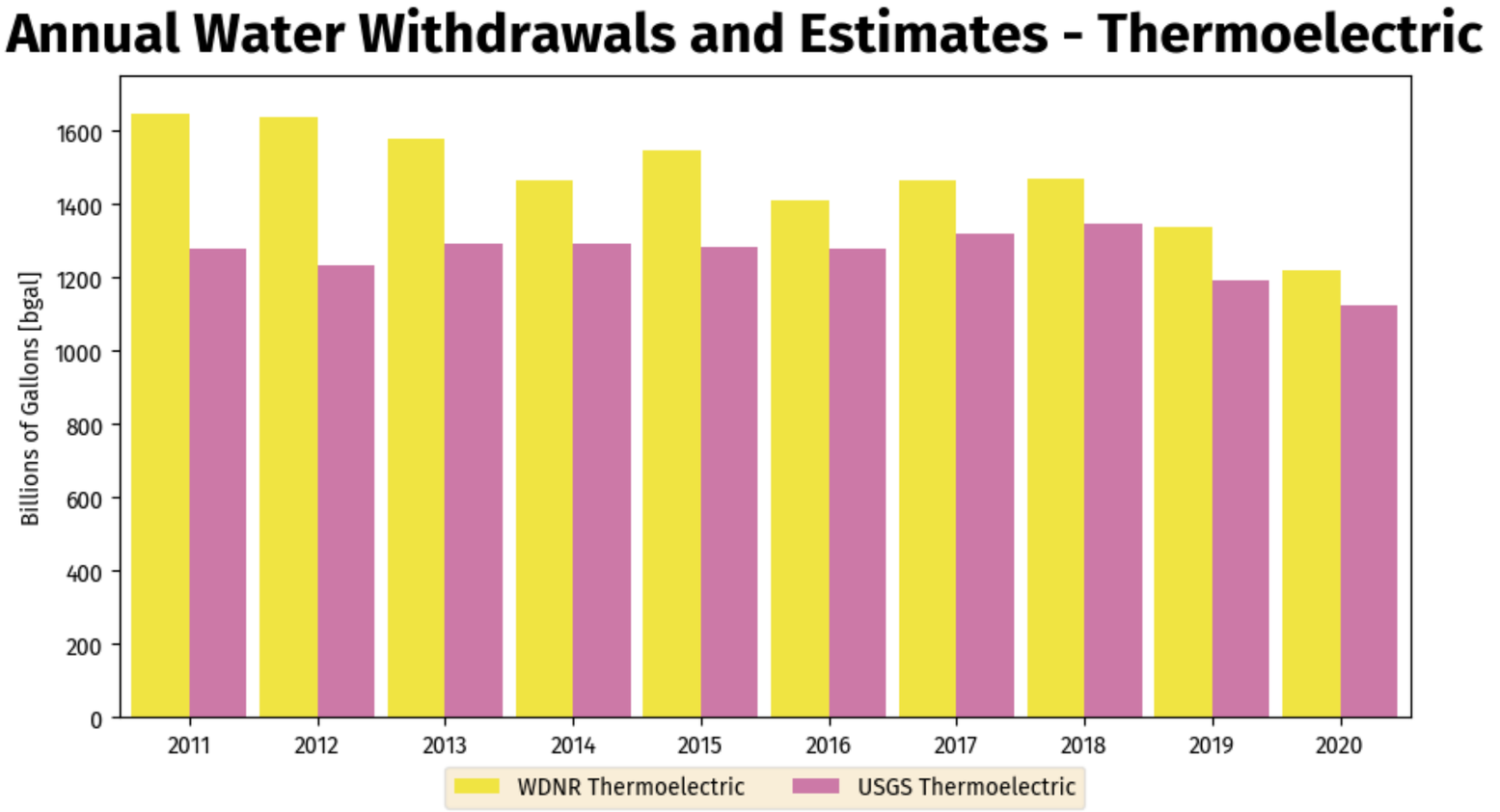
Volumes of USGS Estimates

- Public supply estimates are generally similar
- Surface water estimates differ more than groundwater estimates
- Public supply differs by ~5.3 billion gallons annually



Volumes of USGS Estimates

- Thermoelectric estimates are closer in later years
- Thermoelectric differs by ~215 billion gallons annually
- 4 plants closed in 2018, captured in both records



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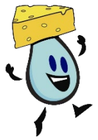
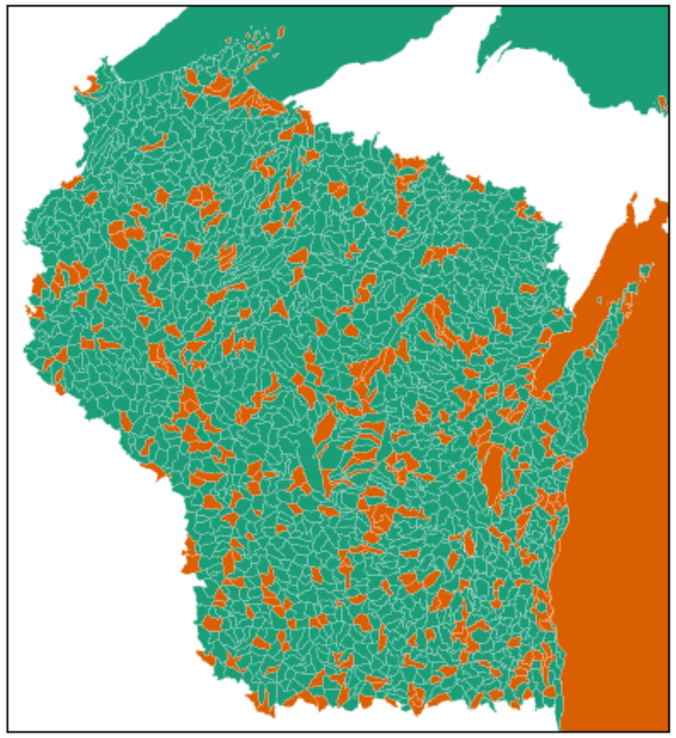


Spatial Differences of USGS Estimates

Monthly USGS Estimates Compared to Water Use Reporting

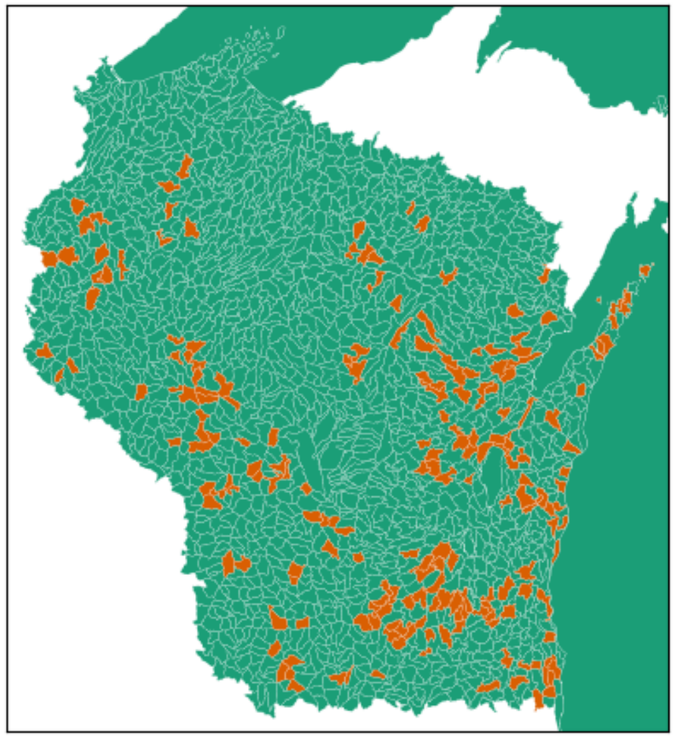
Public Supply Groundwater



- USGS and Reporting Agree that Water Use is/isn't Present
- USGS and Reporting Disagree that Water Use is/isn't Present

Monthly USGS Estimates Compared to Water Use Reporting

Groundwater Irrigation



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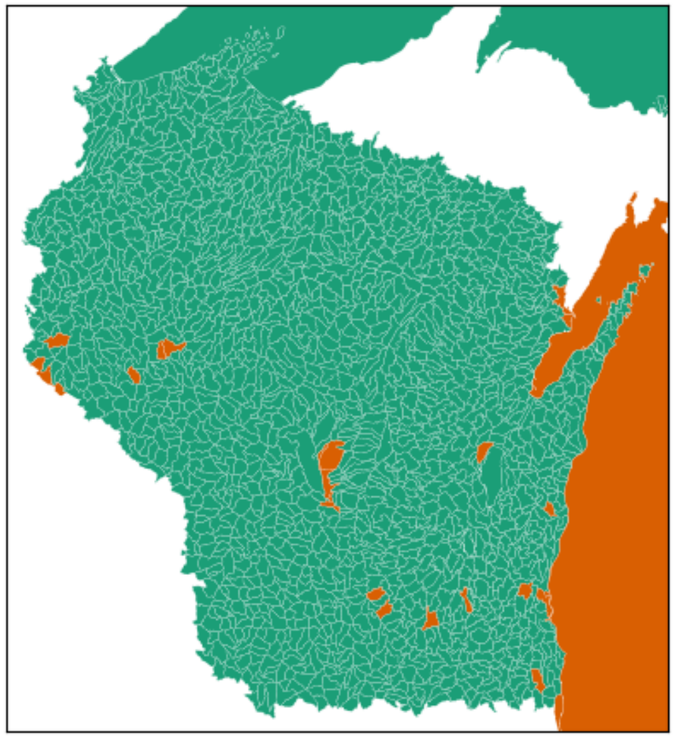
Monthly USGS Estimates Compared to Water Use Reporting

Thermoelectric



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Spatial Differences of USGS Estimates cont'd

- Thermoelectric is the most spatially similar to reporting
- Groundwater Irrigation is the least spatially like reporting
- Varying levels of agreement for the rest

	% Subwatersheds that Agree	% Subwatersheds that Disagree
All Irrigation	87.3%	12.7%
Groundwater Irrigation	89.0%	11.0%
Surface Water Irrigation	97.5%	2.5%
Groundwater Public Supply	80.8%	19.2%
Surface Water Public Supply	93.6%	6.4%
Thermoelectric Use	98.7%	1.3%

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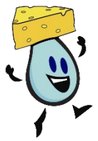
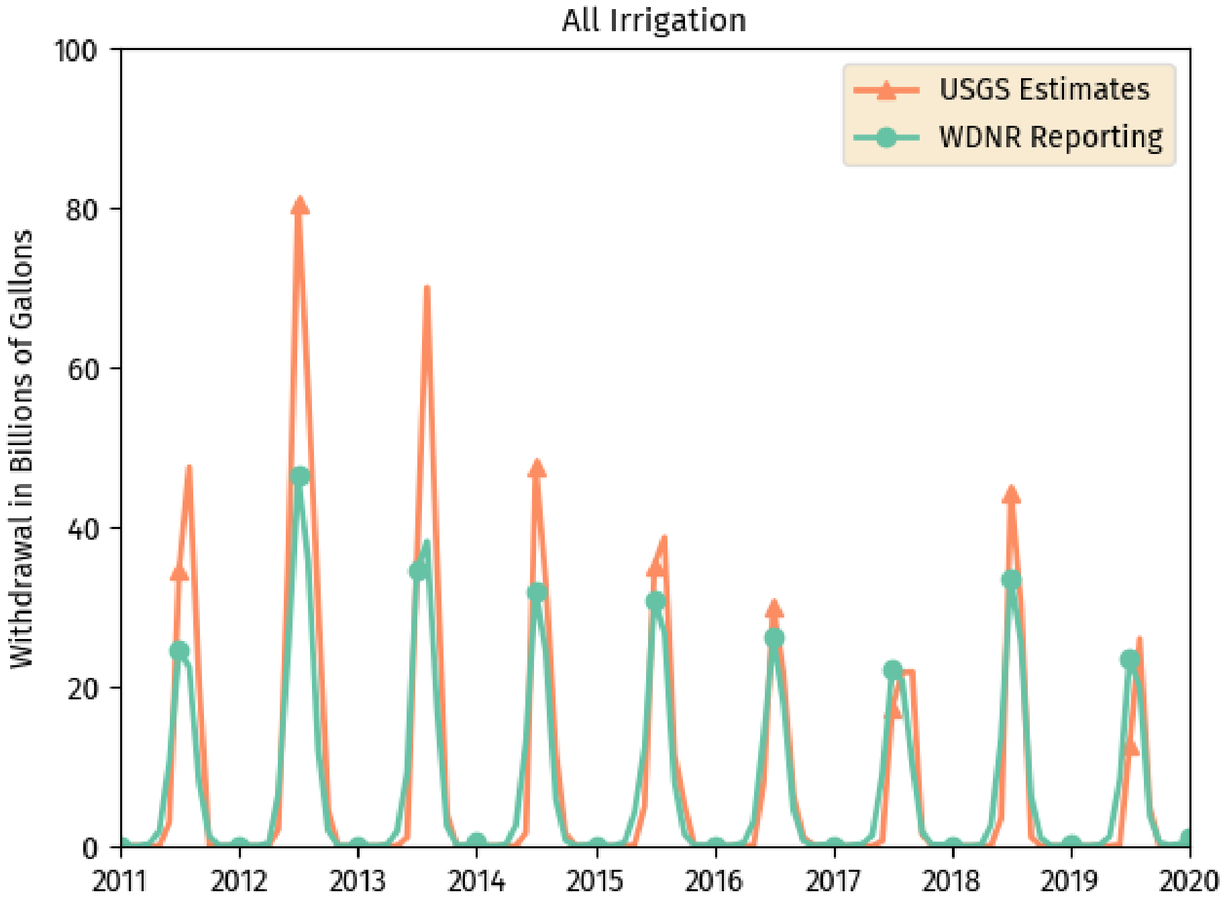


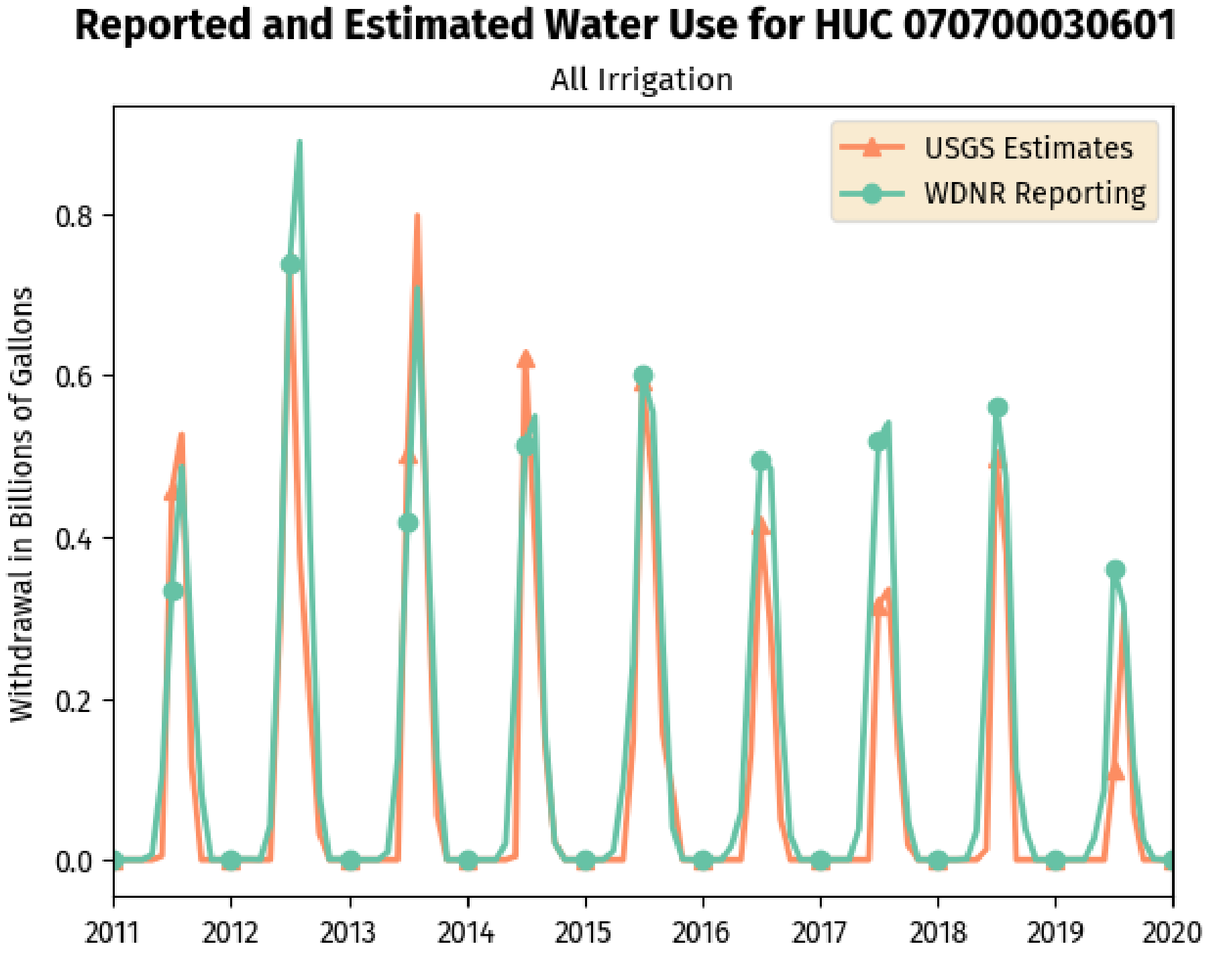
Seasonality of USGS Estimates

- Irrigation is predicted and reported in summer months
- Peaks are closer in volume in later years
- Cranberry irrigation not included



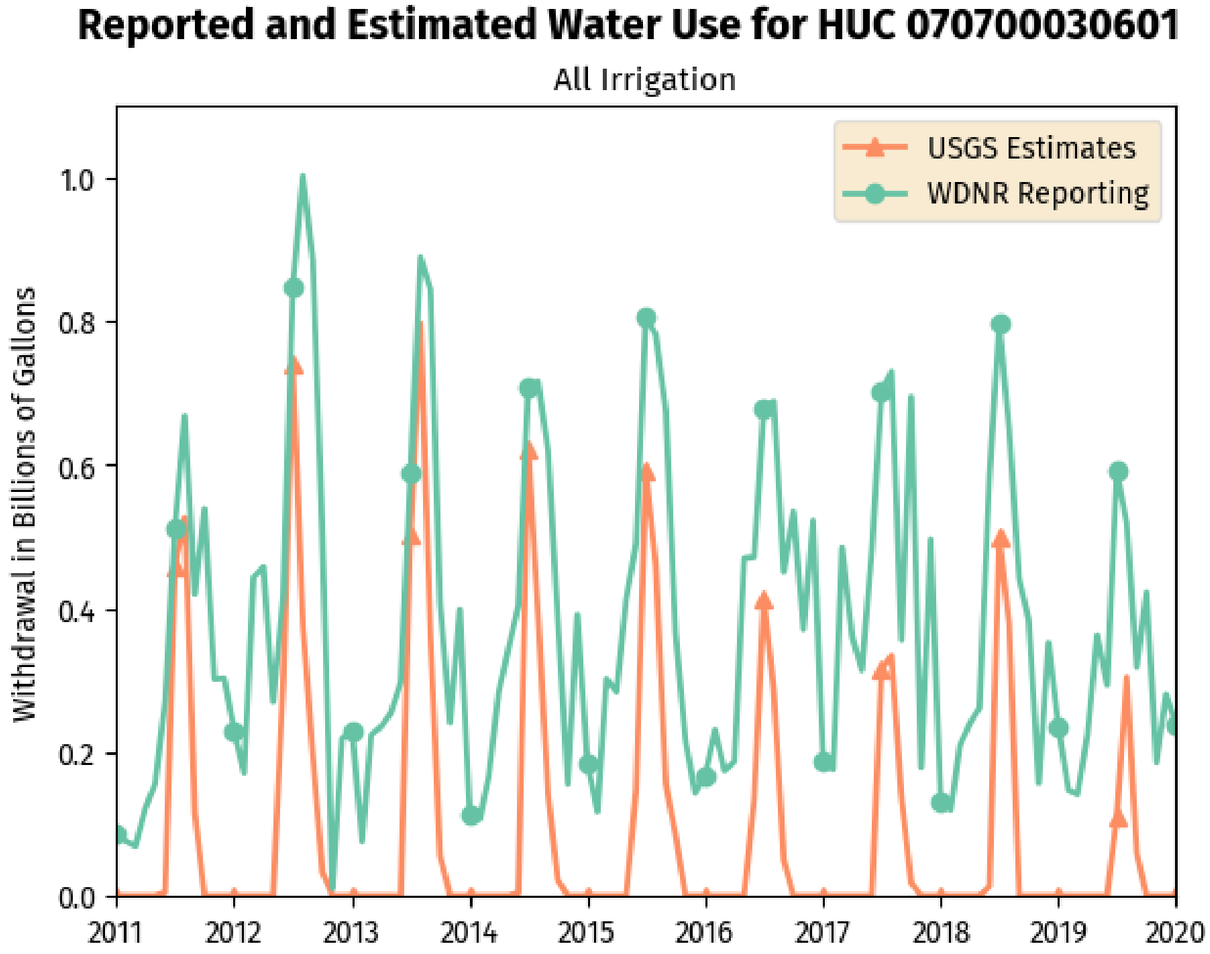
Seasonality of USGS Estimates

- Name: Leola Ditch
- 74 High Capacity Wells
- 9 Surface Water Sources
- Peaks are generally the same
  - Surface water use in the off-season

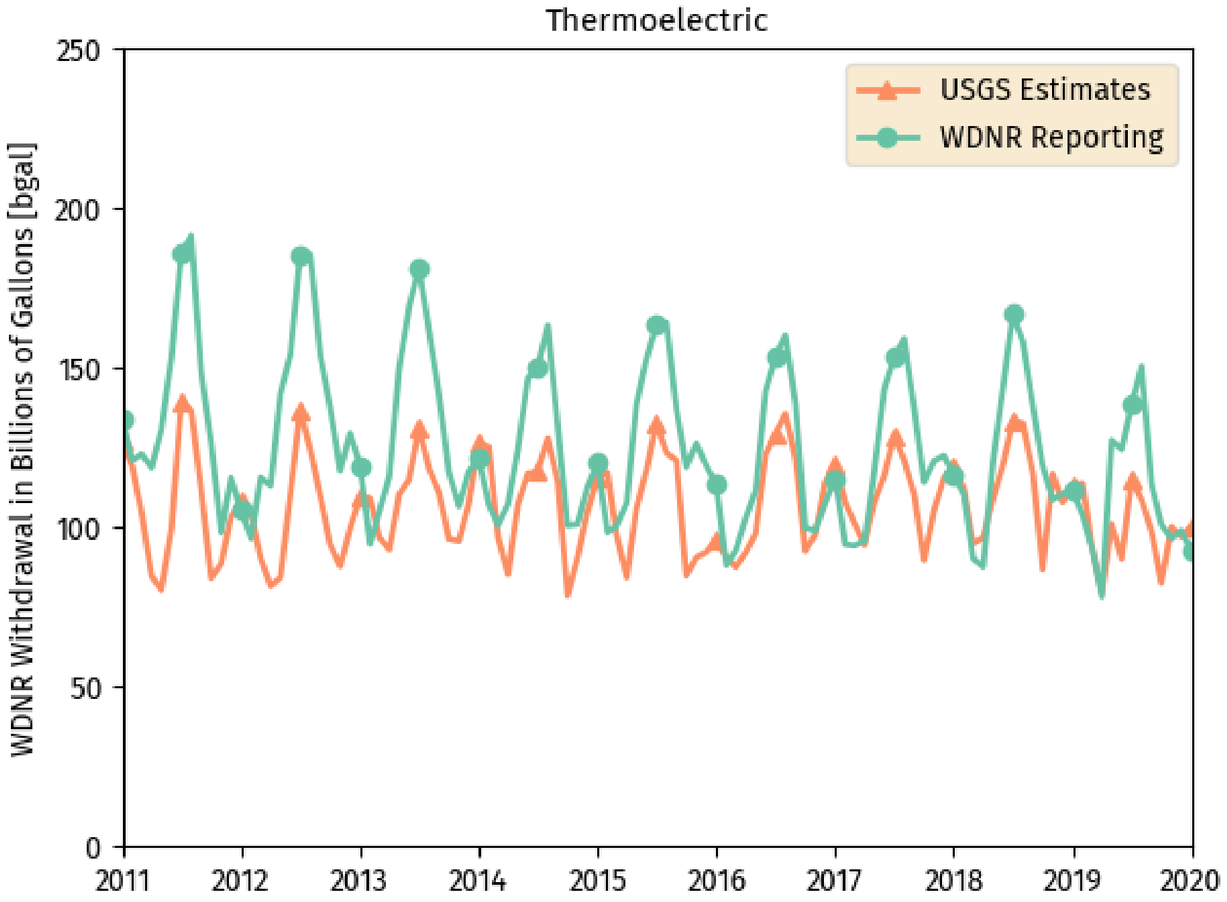


Seasonality of USGS Estimates

- Same subwatershed
- Includes cranberry irrigation water use

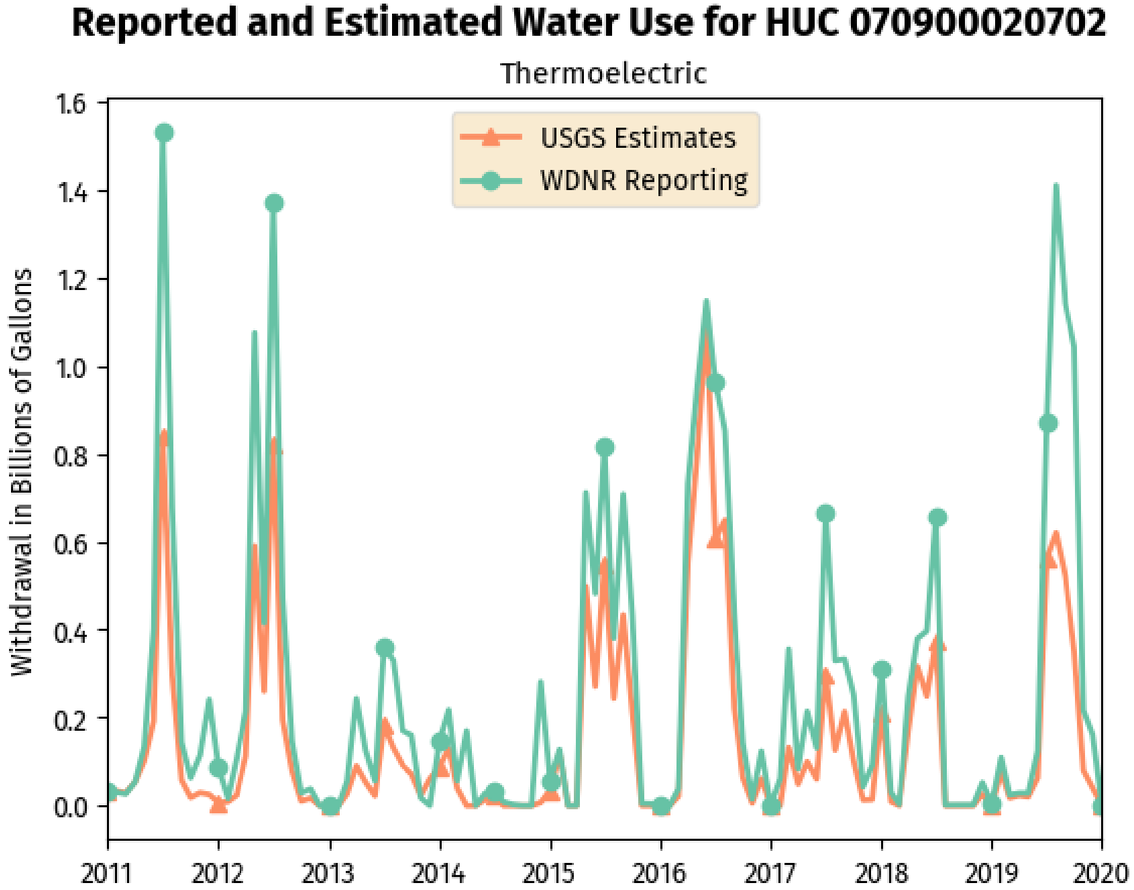


Seasonality of USGS Estimates cont'd



- Peaks and valleys occur at same times
- USGS estimates show timings of peaks and valleys but with different amplitudes

Thermoelectric Example



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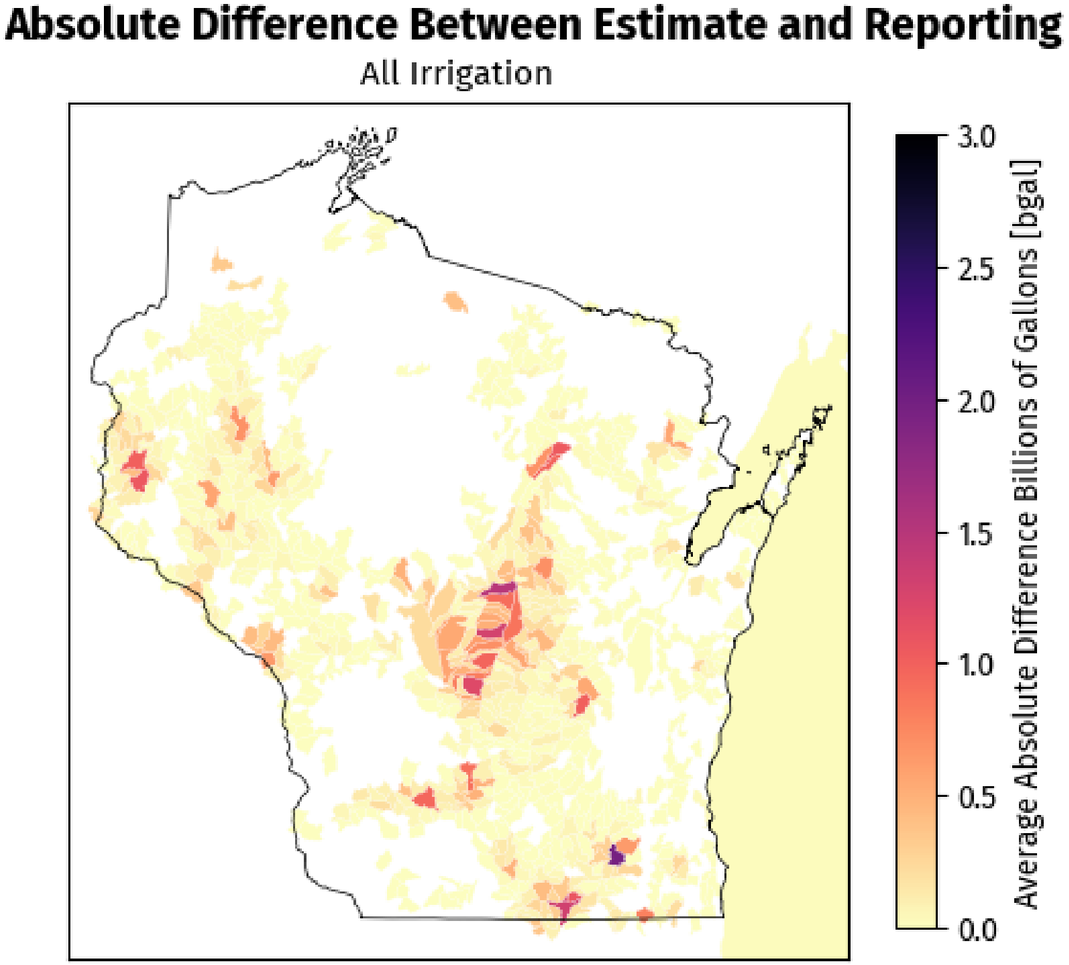
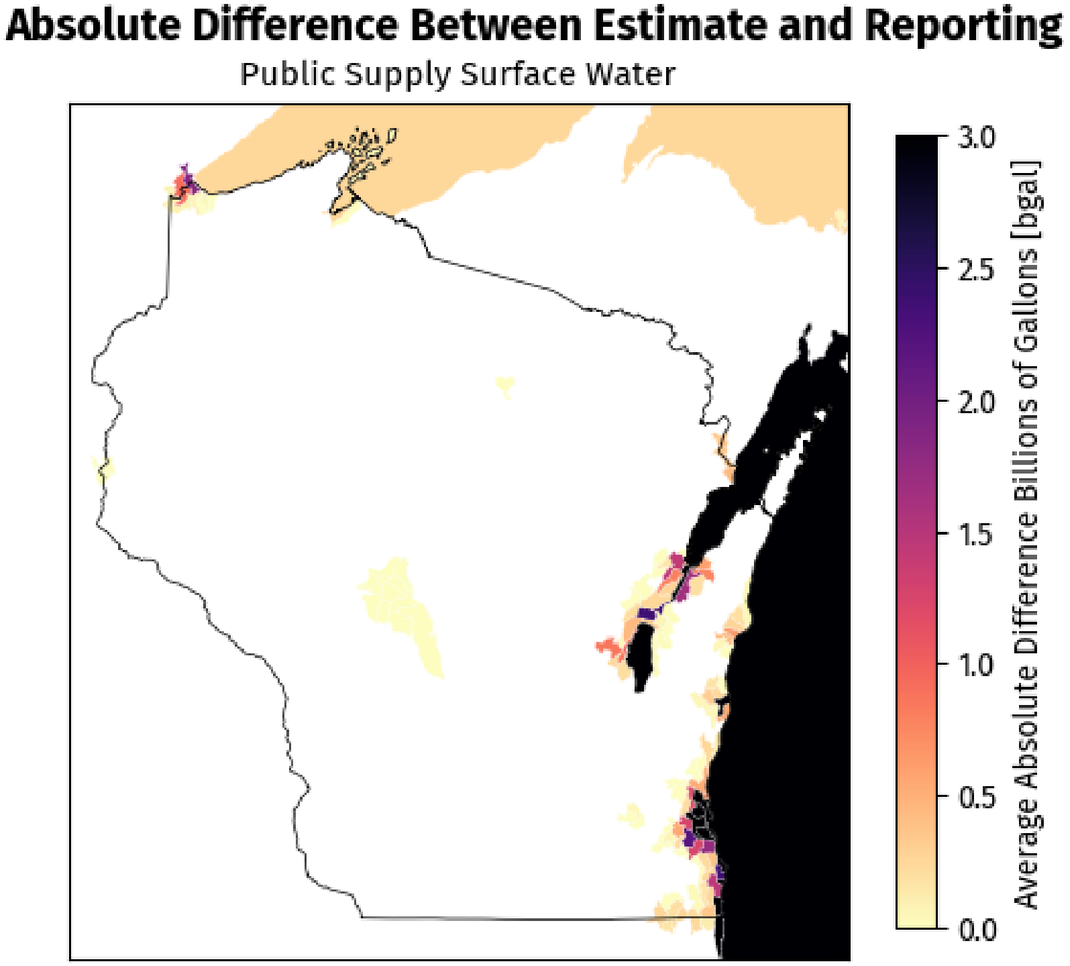
Statewide Estimation

- Groundwater irrigation is similar
- Greatest difference is in central sands



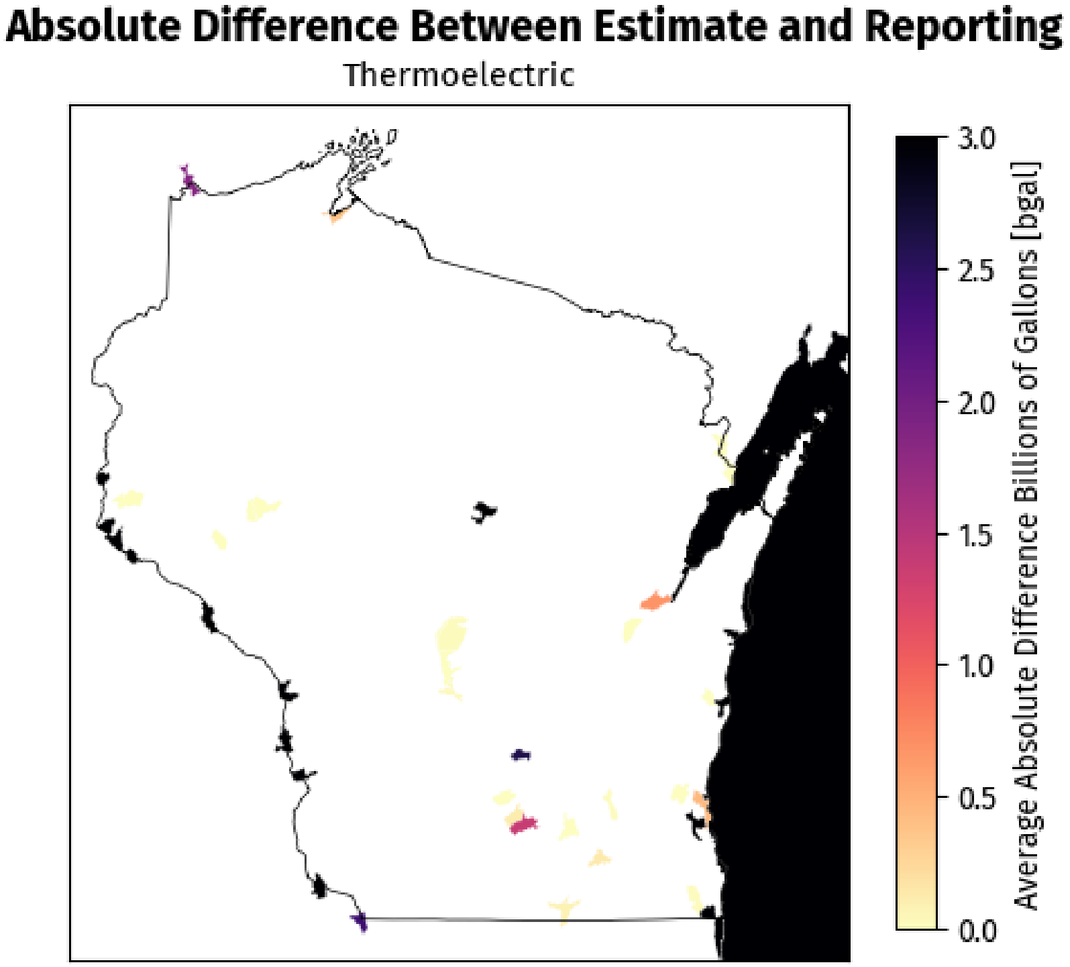
Statewide Estimation cont'd

- Public supply is generally similar to reporting
- Surface water differs
  - Estimates attribute water use to communities/use sites
  - Reporting shows water use at withdrawal sources



Statewide Estimation cont'd

- Thermoelectric is similar to reporting
- Differs from reporting in same manner as surface water



Conclusions + Questions?

- USGS Estimates and WDNR Reporting are not 1:1
  - Estimates are similar
- Models can be progressively tuned over time
- For projects spanning multiple states, it may be convenient to use the USGS estimates
- For local work, state data may be better

USGS Water Use Reanalysis

- Martin, D.J., Regan, R.S., Haynes, J.V., Read, A.L., Henson, W.R., Stewart, J.S., Brandt, J.T., and Niswonger, R.G., 2023, Irrigation water use reanalysis for the 2000-20 period by HUC12, month, and year for the conterminous United States: U.S. Geological Survey data release, https://doi.org/10.5066/P9YWR0OJ.
- Haynes, J.V., Read, A.L, Chan, A.Y., Martin, D.J., Regan, R.S., Henson, W.R., Niswonger, R.G., and Stewart, J.S., 2023, Monthly crop irrigation withdrawals and efficiencies by HUC12 watershed for years 2000-2020 within the conterminous United States: U.S. Geological Survey data release, https://doi.org/10.5066/P9LGISUM.
- Luukkonen, C.L., Alzraiee, A.H., Larsen, J.D., Martin, D.J., Herbert, D.M., Buchwald, C.A., Houston, N.A., Valseth, K.J., Paulinski, S., Miller, L.D., Niswonger, R.G., Stewart, J.S., and Dieter, C.A., 2023, Public supply water use reanalysis for the 2000-2020 period by HUC12, month, and year for the conterminous United States: U.S. Geological Survey data release, https://doi.org/10.5066/P9FUL880.
- Galanter, A.E., Gorman Sanisaca, L.E., Skinner, K.D., Harris, M.A., Diehl, T.H., Chamberlin, C.A., McCarthy, B.A., Halper, A.S., Niswonger, R.G., Stewart, J.S., Markstrom, S.L., Embry, I., and Worland, S., 2023, Thermoelectric-power water use reanalysis for the 2008-2020 period by power plant, month, and year for the conterminous United States: U.S. Geological Survey data release, https://doi.org/10.5066/P9ZE2FVM.