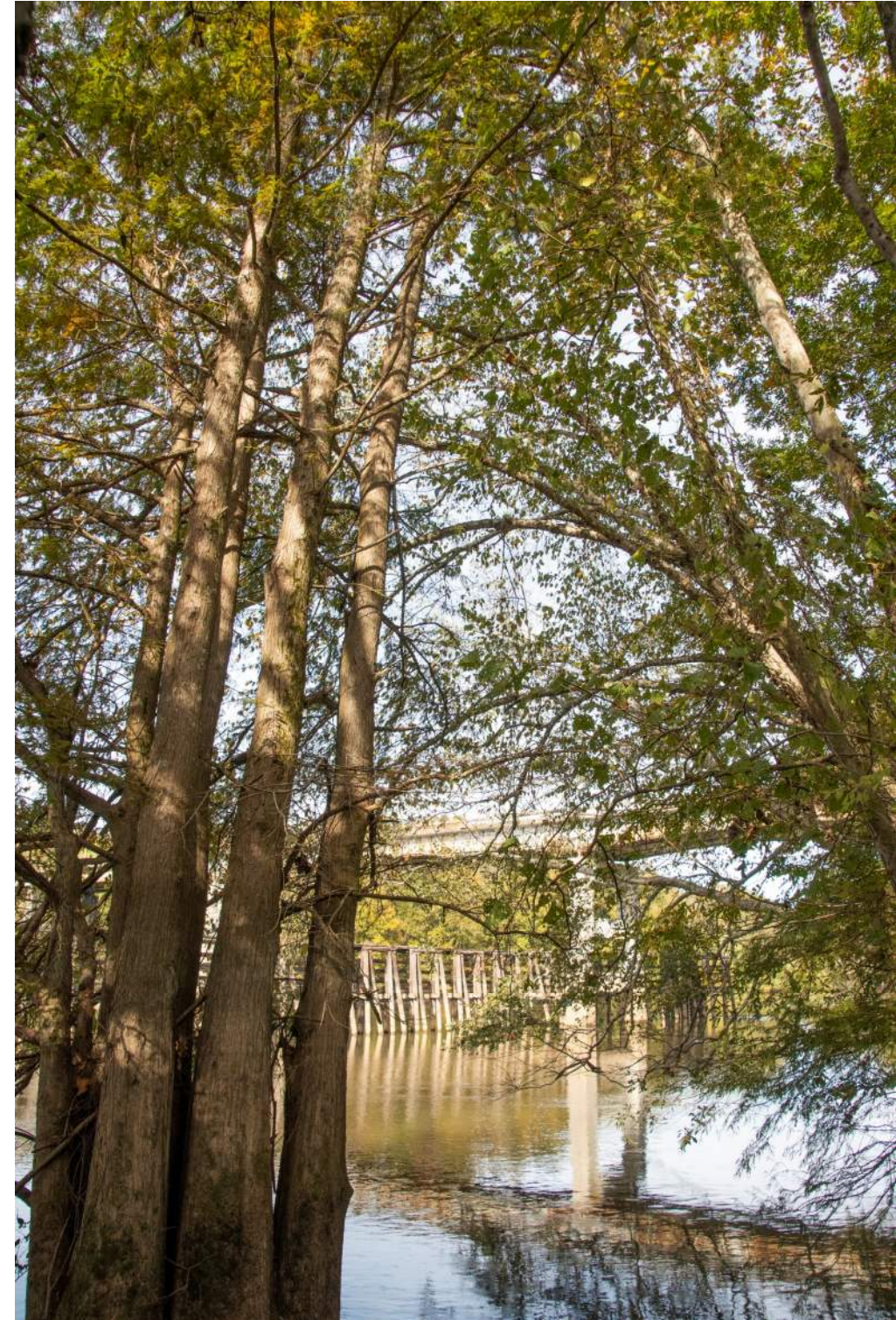# Groundwater Demand Projection Methodologies

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January 9, 2025

Lower Savannah-Salkehatchie River Basin Council Meeting #12

Agenda Item 4

Projections vs Forecasts

Forecast

- Educated guess.
- Based on expected conditions and actions.
- Timeframe limited by predictability of future conditions.
- Aim to be accurate.

Projection

- Extrapolation of trend.
- Based on hypothetical scenarios.
- Timeframe can extend beyond the limits of effective forecasting.
- Aim to be informative.

Projection Methodologies

## Projected Demand = (Baseline Demand) X (Driver Variable)

- **Three projection scenarios** based on different combinations of Baseline Demand estimates and Driver Variable growth rates.

- **Baseline Demand**: based on either monthly median water demands or maximum monthly water demands as determined from 2013-2023 reported water use.

- **Moderate Projection Scenario**: Baseline Demand is based on *monthly median* withdrawal volumes and a "moderate" (business-as-usual) growth rate for the Driver Variable (used for surface water simulations).

- **High Growth Projection Scenario**: Baseline Demand is based on *monthly median* withdrawal volumes and an "aggressive" growth rate for the Driver Variable (*not* used in surface water simulations).

- **High Demand Projection Scenario**: Baseline Demand is based on *monthly maximum* withdrawal volumes and an "aggressive" growth rate for the Driver Variable (used for surface water simulations).
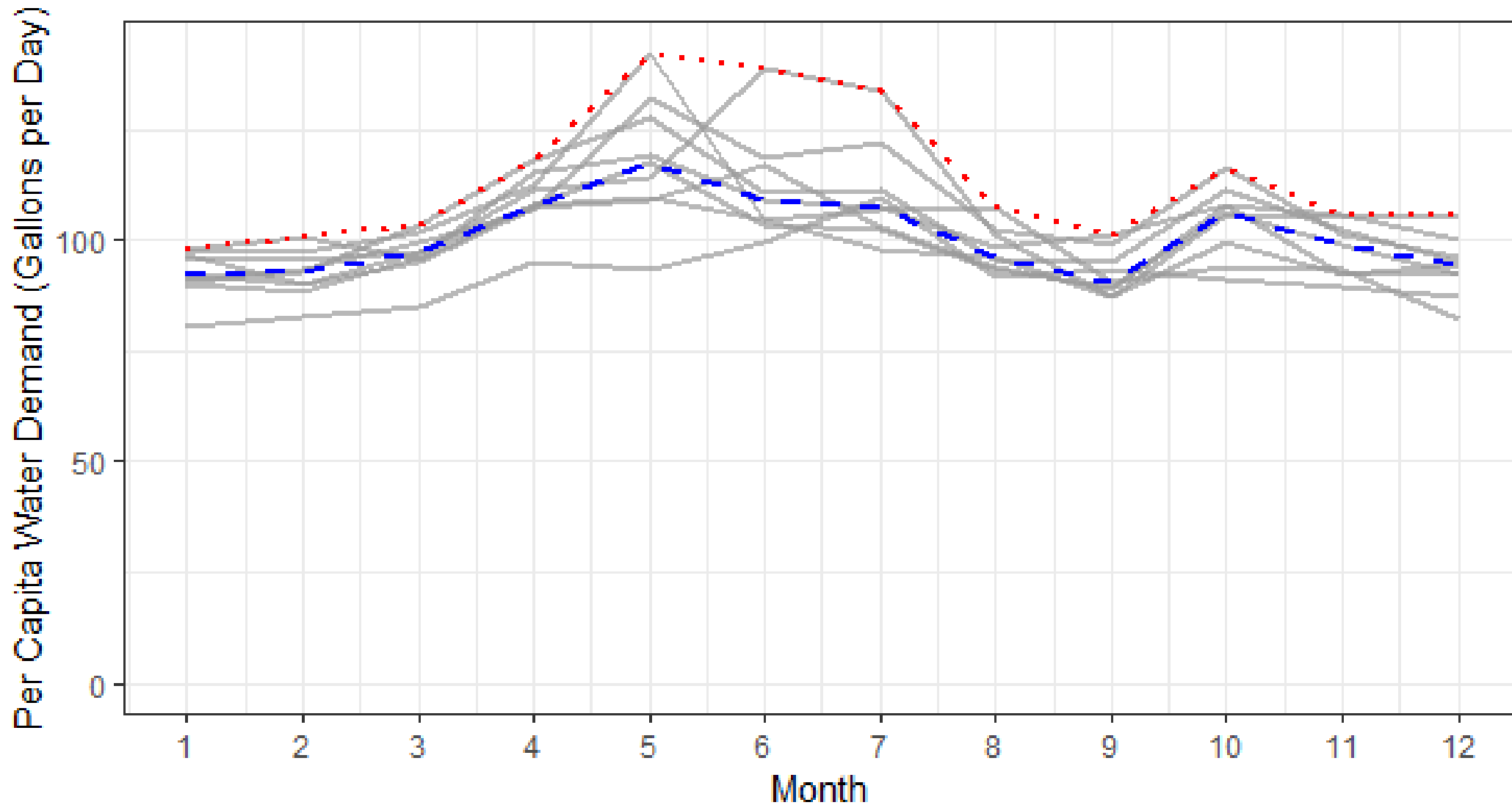
Driver Variables

Water Use Category	Driver Variable
Public Water Supply	Population
Manufacturing/Industry	Economic Growth
Thermo-electric Power	Electricity Production
Agriculture/Golf Courses	Irrigated Acres

Assumptions behind "moderate" and "aggressive" growth rates for each Driver Variable will be presented
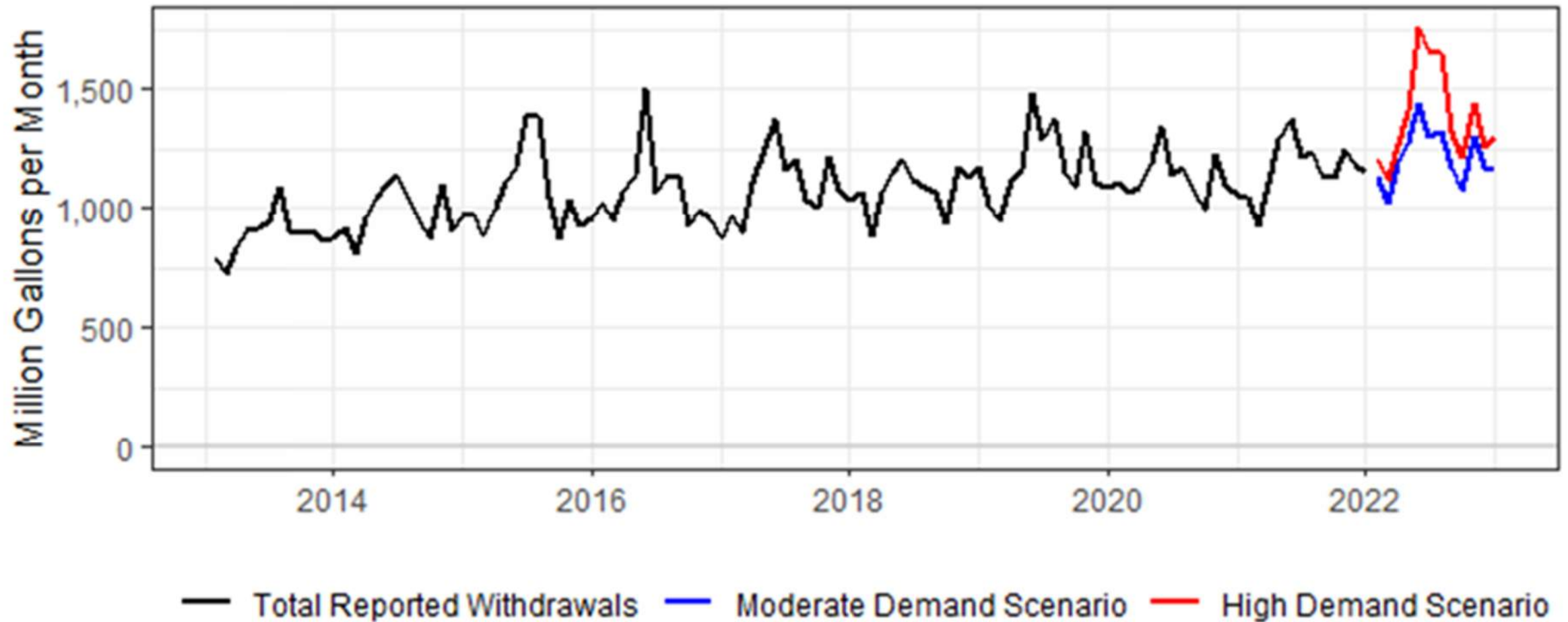
Public Water Supply – Baseline Demands
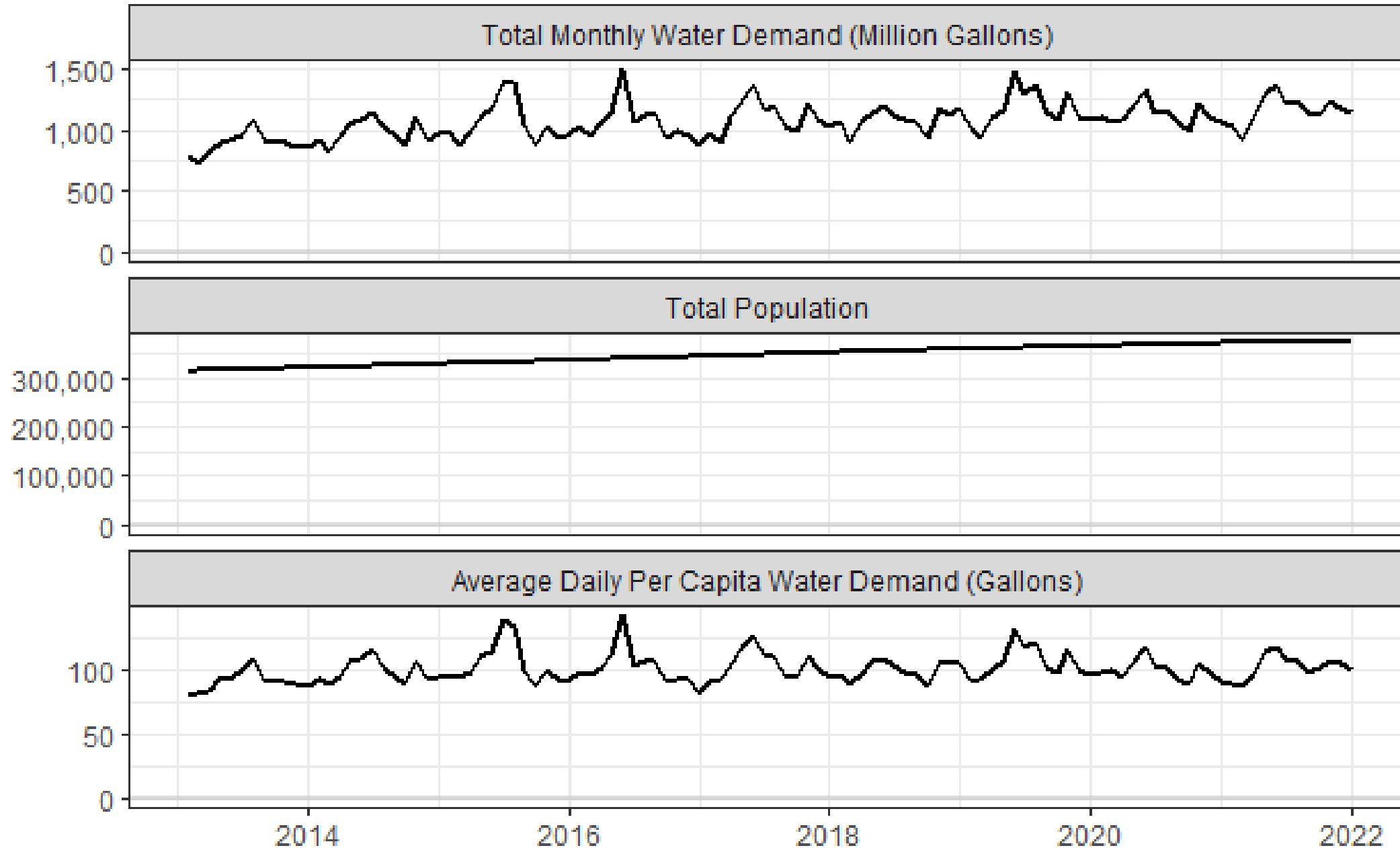
Public Water Supply – Baseline Demands

Public Water Supply Baseline Demands - Example

Population Projections

Moderate Projection Scenario

- SC Office of Revenue and Fiscal Affairs projections through 2038 are applied.

- After 2038, counties with positive growth rates are linear extrapolated.

- For counties with negative growth rates, growth rates are set to 0 after 2038.

High Growth and High Demand Projection Scenarios

- Average annual growth rates lower than the state average (0.83%) are set equal to the state average.

- All county growth rates are increased by %10.
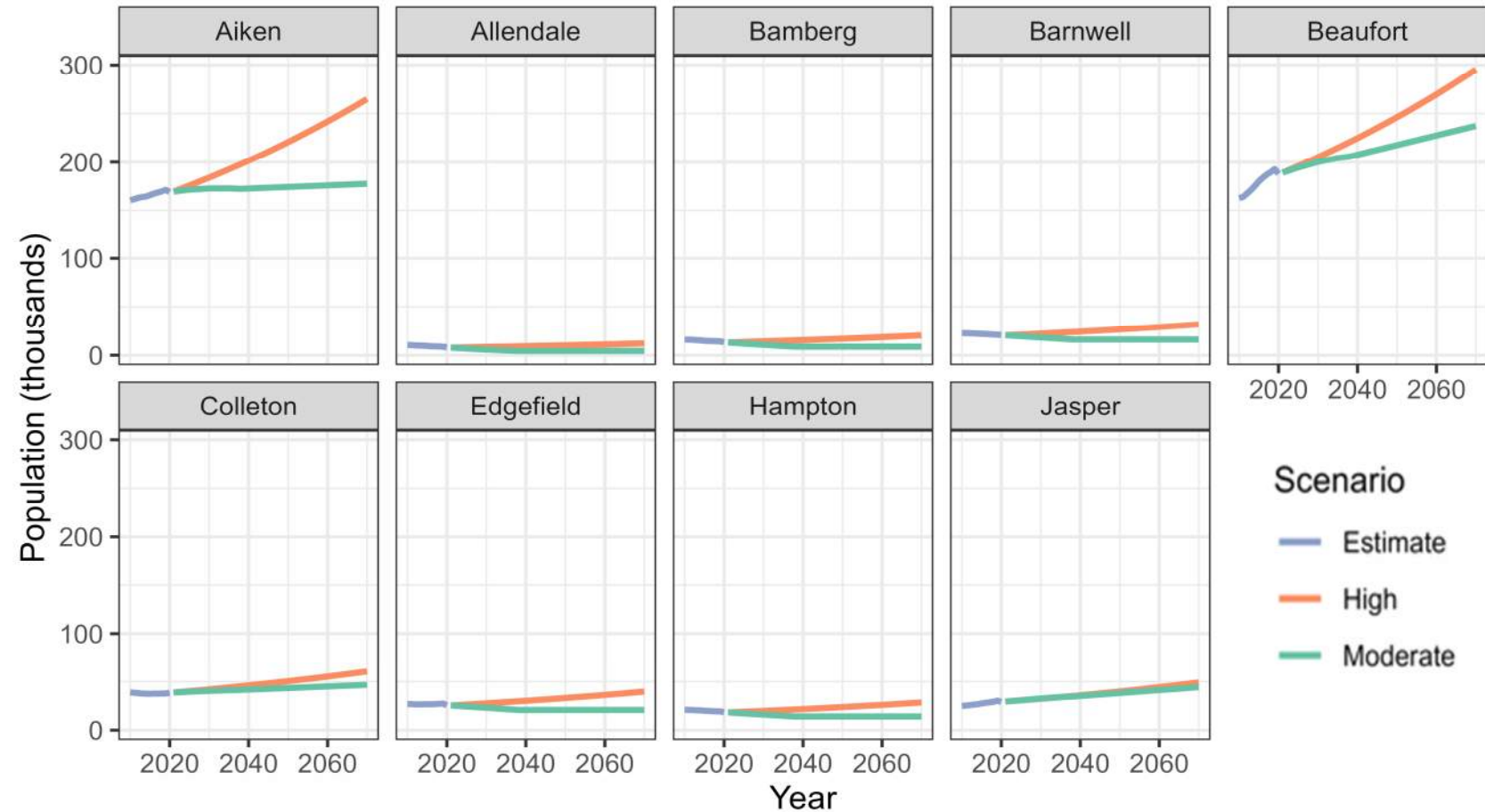
Manufacturing – Driver Variables

- Moderate Projection Scenario:
  - Uses projected Annual Economic Growth Rates from the US Energy Information Agency (EIA).

- High Growth and High Demand Projection Scenarios:
  - If Sector growth rate is less than the national average (2.1%), then the national average rate is applied.

- Growth rates range from 0.1% to 2.1% depending on the economic sector.
  - Over 50 years, that leads to a total increase from 5% to over 160%.

- Note: even with economic growth, actual water demand for many manufacturing sectors has declined as industrial processes become more efficient and manufacturers develop higher-value products.

Manufacturing – Driver Variables

2023 Projected Annual Economic Growth Rates from the US Energy Information Agency

Food Products	1.1%	Plastics and Rubber Products	1.5%
Beverages and Tobacco Products	-0.2%	Stone, Clay, and Glass Products	0.8%
Textile Mills and Products	-0.1%	Glass and Glass Products	0.7%
Wood Products	0.1%	Cement and Lime	0.7%
Furniture and Related Products	1.3%	Other Nonmetallic Mineral Products	0.9%
Paper Products	0.3%	Primary Metals Industry	1.1%
Printing	-0.1%	Iron and Steel Mills and Products	0.5%
Chemical Manufacturing	1.7%	Alumina and Aluminum Products	1.1%
Bulk Chemicals	1.2%	Other Primary Metal Products	2.0%
Inorganic	0.5%	Fabricated Metal Products	1.3%
Organic	1.2%	Machinery	1.4%
Resin, Synthetic Rubber, and Fibers	1.4%	Computers and Electronics	2.4%
Agricultural Chemicals	1.2%	Transportation Equipment	1.4%
Other Chemical Products	2.1%	Electrical Equipment	2.3%
Petroleum and Coal Products	0.2%	Miscellaneous Manufacturing	0.9%
Petroleum Refineries	0.3%		
Other Petroleum and Coal Products	-0.5%		

Lower Savannah – Salkehatchie Manufacturing Growth Rates

Industry Sector	Name	Moderate Scenario (EIA projections)	High Growth and High Demand Scenarios
Paper Products	Kimberly Clark	0.3%	2.1%
Chemical Manufacturing	Archroma Us Inc	0.5% (inorganic)	2.1%
Miscellaneous Manufacturing	Resort, Recycled Group	0.9%	2.1%
Plastics and Rubber Products	Bridgestone	1.5%	2.1%
Wood Products	Georgia-Pacific Wood Products LLC	0.1%	2.1%

Agricultural Growth Rates

- ## Moderate Scenario:

  - Withdrawals projected to grow 38% (0.65% average annual growth rate) over 50-year Planning Horizon.

  - Source: *Brown, Thomas C., Romano Foti, and Jorge A. Ramirez, 2013. Projected freshwater withdrawals in the United States under a changing climate. Water Resources Research, Vol. 49, 1259- 1276.*

- ## High Growth and High Demand Scenarios:

  - Withdrawals projected to grow 44% (0.72 average annual growth rate) over the 50-year planning horizon.

  - Source: *Crane-Droesch, Andrew, Elizabeth Marshall, Stephanie Rosch, Anne Riddle, Joseph Cooper, and Steven Wallander. Climate Change and Agricultural Risk Management Into the 21st Century, ERR-266, U.S. Department of Agriculture, Economic Research Service, July 2019.*
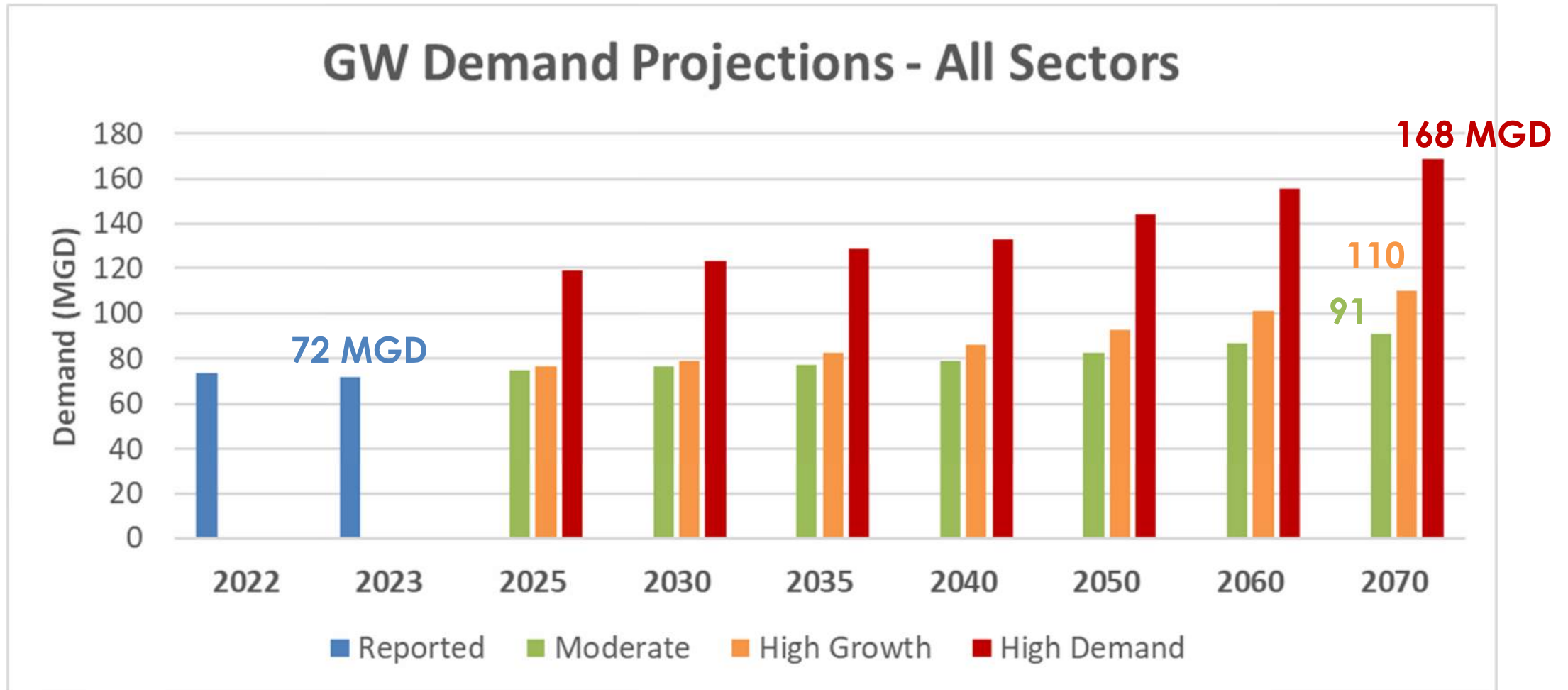
Thermoelectric*, Golf, Mining, and Other Categories

- No projected growth for these categories – Monthly Baseline Demand stays constant over Planning Horizon.

- Monthly Baseline Demand:

    - Moderate and High Growth Demand Scenario – monthly median demand for 2013-2023 period.

    - High Demand Scenario – monthly maximum demand for the 2013-2023 period.

* Thermoelectric Demands are based on Integrated Resource Plans developed by individual power utilities and feedback they provide. For the Lower Savannah-Salkehatchie, no new facilities or facility expansions were planned.

Groundwater Projections
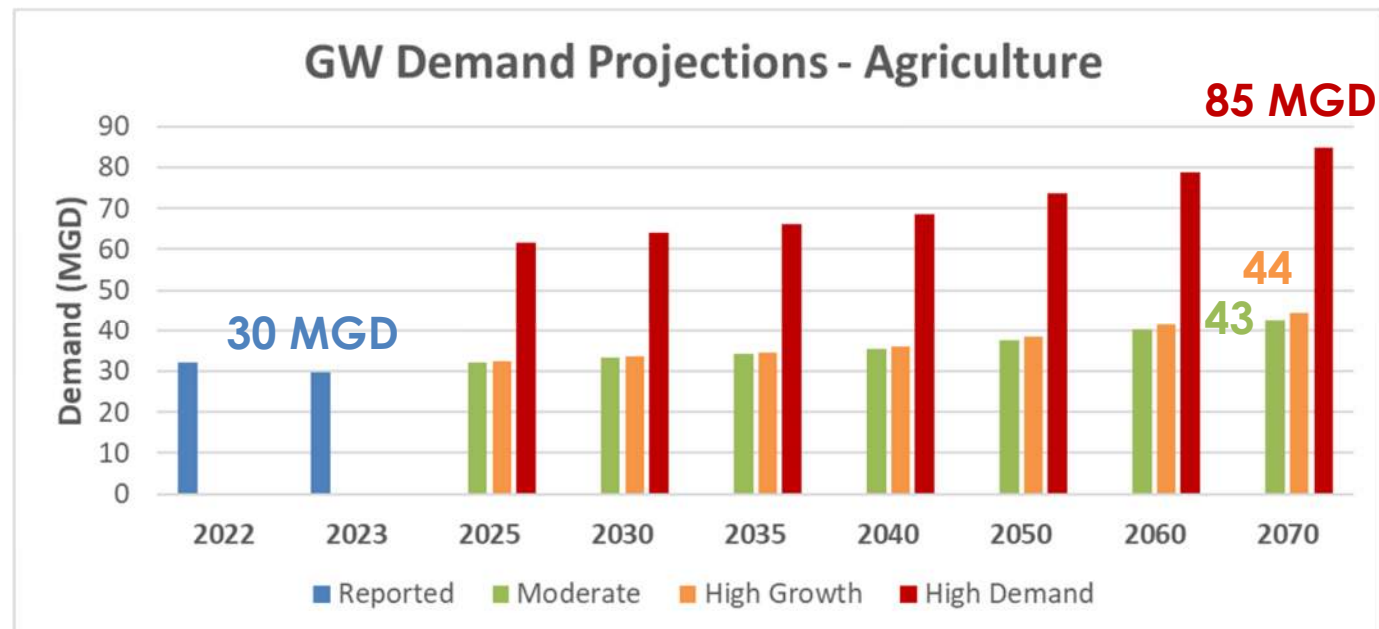## Lower Savannah and Salkehatchie Combined

GW Demand Projections - All Sectors

72 MGD
91
110
168 MGD

Demand (MGD)

2022　2023　2025　2030　2035　2040　2050　2060　2070

■ Reported　■ Moderate　■ High Growth　■ High Demand

Moderate Demand Scenario: 26% Increase
High Growth Scenario: 53% Increase
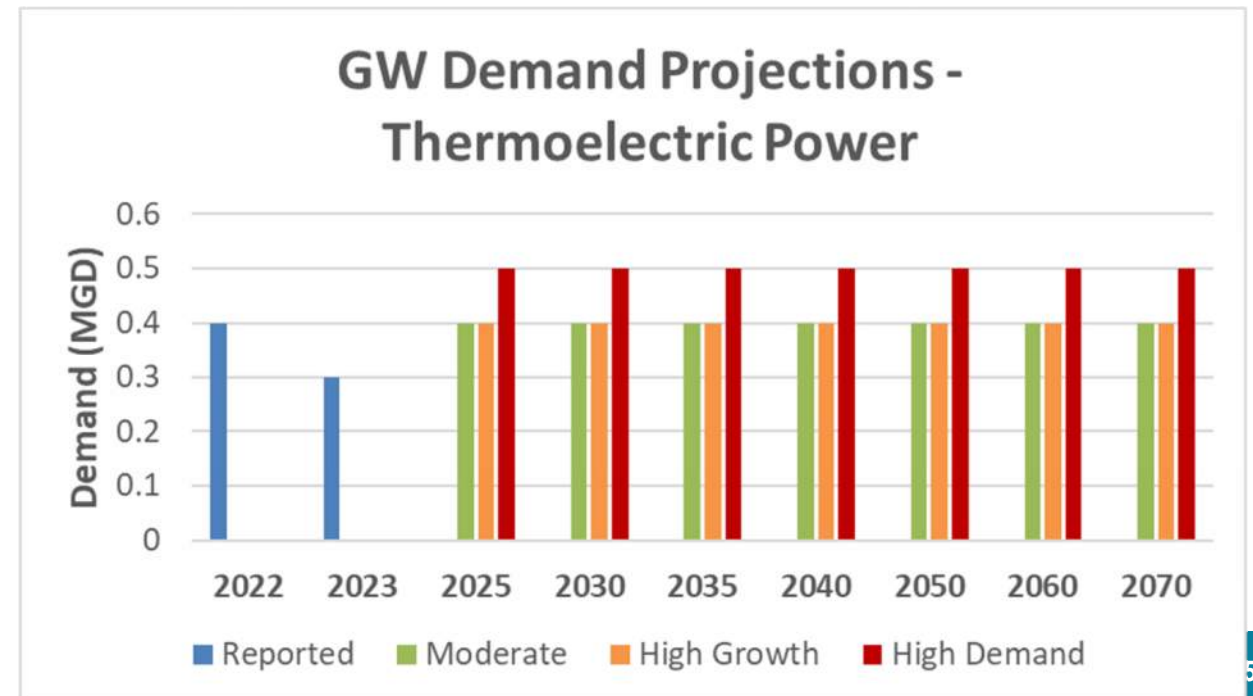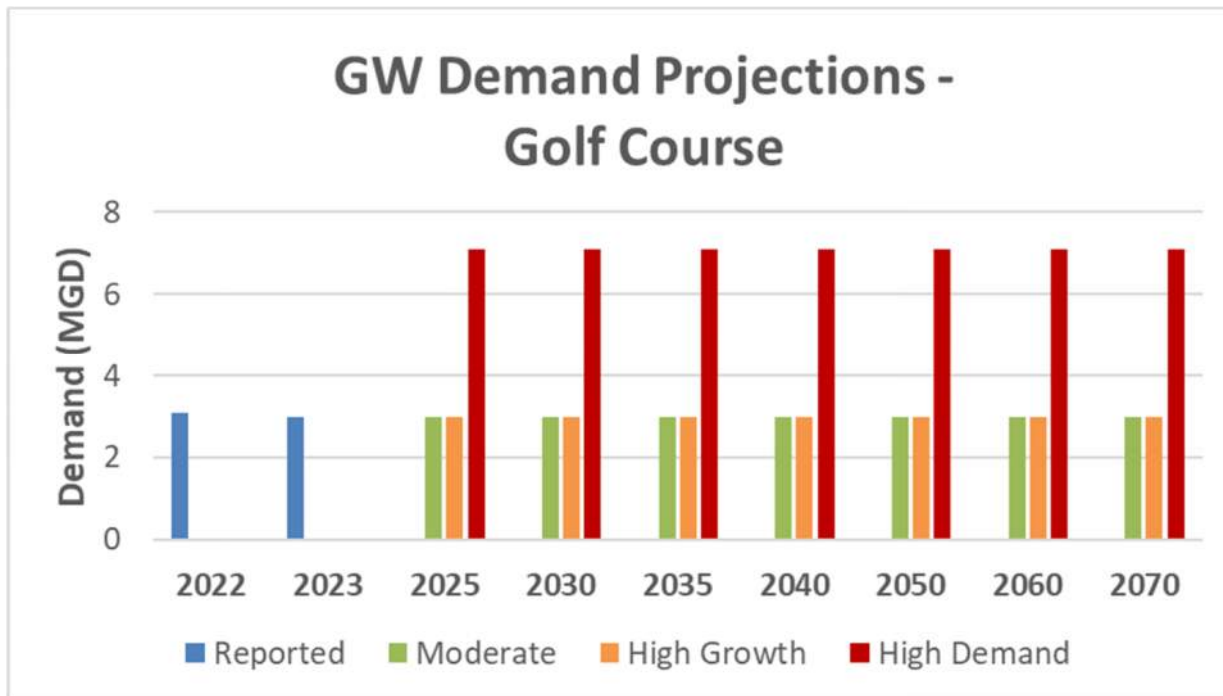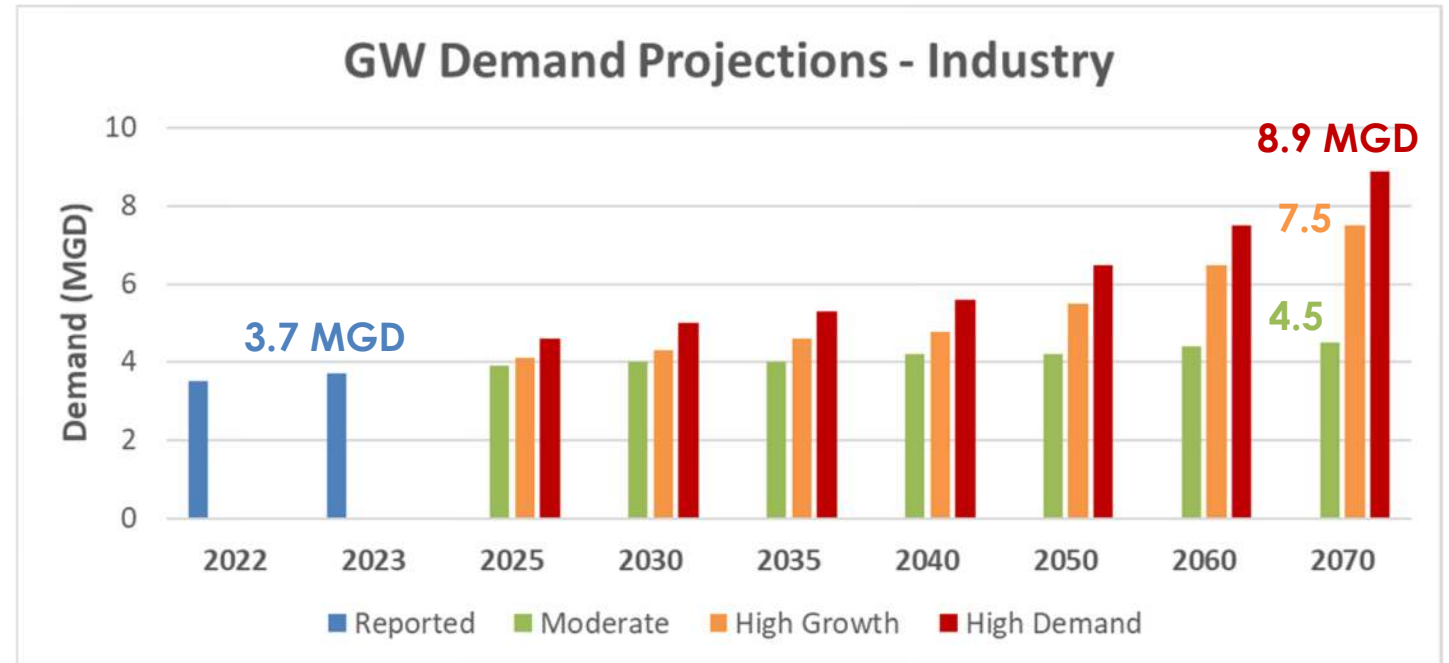**High Demand Scenario: 133% Increase**

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Groundwater Projections by Sector
Lower Savannah and Salkehatchie Combined

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Groundwater Projections by Sector

Lower Savannah and Salkehatchie Combined

GW Demand Projections - Industry

GW Demand Projections - Golf Course

GW Demand Projections - Thermoelectric Power
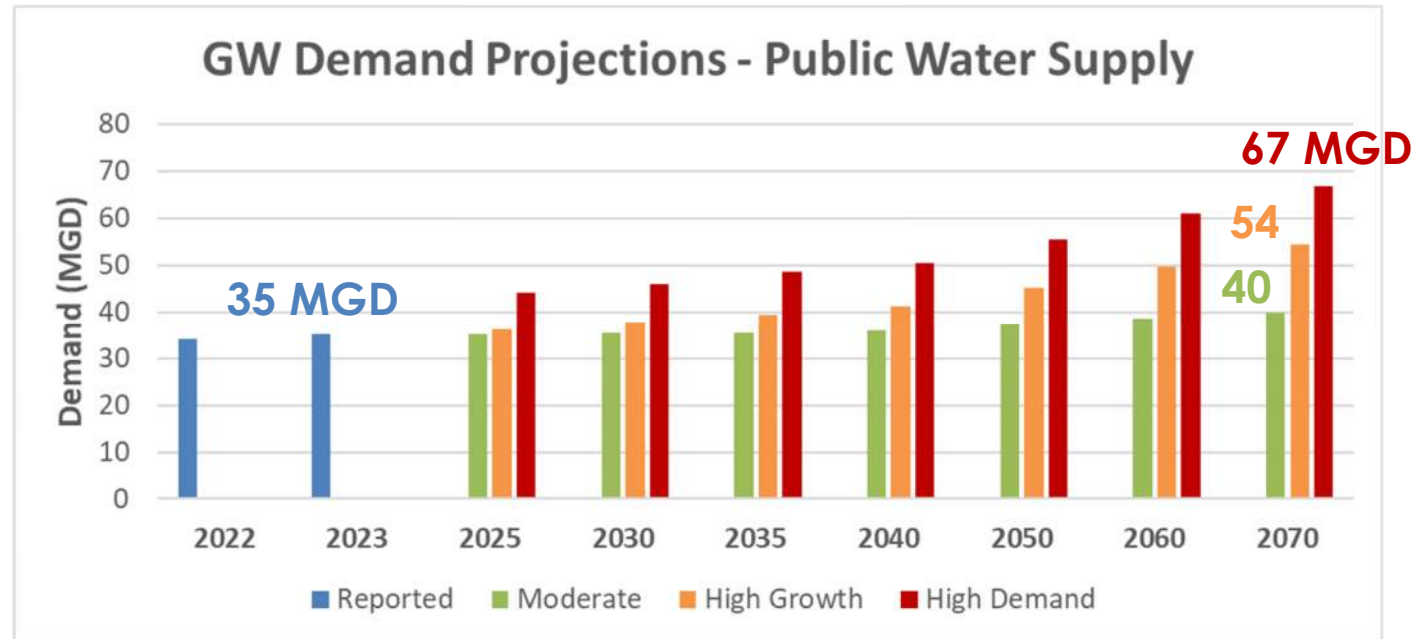
Groundwater Projections by County
Lower Savannah and Salkehatchie Combined

Moderate									
Year	Aiken	Allendale	Bamberg	Barnwell	Beaufort	Colleton	Edgefield	Hampton	Jasper	Total
2023 (Reported)	14	13.2	6.6	4.6	19	4.7	0	8.1	1.9	72.1
2040	14.4	13.7	6.8	5	21.3	7.2	0	8.3	2.6	79.3
2070	14.7	16.3	7.8	6.3	24.6	8.4	0	9.4	3.4	90.9

High Growth									
Year	Aiken	Allendale	Bamberg	Barnwell	Beaufort	Colleton	Edgefield	Hampton	Jasper	Total
2023 (Reported)	14	13.2	6.6	4.6	19	4.7	0	8.1	1.9	72.1
2040	16.2	15.2	7.3	5.9	22.2	7.4	0	9	2.7	85.9
2070	20.6	20.7	8.7	8.1	28.4	9.1	0	10.6	3.8	110

High Demand									
Year	Aiken	Allendale	Bamberg	Barnwell	Beaufort	Colleton	Edgefield	Hampton	Jasper	Total
2023 (Reported)	14	13.2	6.6	4.6	19	4.7	0	8.1	1.9	72.1
2040	20	23.7	14.4	11.4	30.7	12	0	16.2	4.7	133.1
2070	25.6	31.7	17.3	15.8	38.1	14.6	0	19	6.7	168.8

All values in million gallons per month (MGD)

Questions?

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