

Forecasting Agricultural Water Demand

- Approach, like all forecasting, looks to trends from the past and considers foreseeable changes:
 - What crops will Georgia farmers grow and how many acres of each will be irrigated?
- Demand for specific commodities is dictated by national and international supply and demand. Georgia farmers produce commodities in competition with other producers nationally. USDA projects what that national level of production will be for major commodities. UGA added state and regional influences on crop selection.



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– Where will Georgia farmers grow irrigate those crops?

- History suggests irrigators will continue using the pumps and irrigation hardware they have invested in and will improve and expand irrigation near existing systems.



- Those are areas with suitable soils, proven water supplies, and established farm support businesses.
- All of Georgia's rural counties have room for modest expansion in irrigated fields.

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- **How much water will they apply to future crops?**
- Rainfall and drought periods dictate any growing season's natural water supply. Deficiencies between that rainfall and crop water needs provide irrigation amounts.

- Crop water needs for each week of the growing season are known for all major commodities.
- An examination of weather patterns of the last 60 years can point out how much will likely be used in wet, average and dry growing seasons.



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- What water sources will be tapped for future irrigation?

- Where no restrictions occur, growers will continue using proven water supplies.
- While numbers of surface withdrawals have been static, withdrawals have grown as ponds have been expanded.
- For reliability, groundwater supplies, like the Floridan aquifer will remain the preferred source.



- Taken together, projected crop area and type, predicted irrigation amounts, and location of existing irrigation and water sources can provide reasonable estimates of water demand for good as well as dry years in planning regions and watersheds.

Agriculture Water Demand Forecasting

Why do Ag water use forecasting?

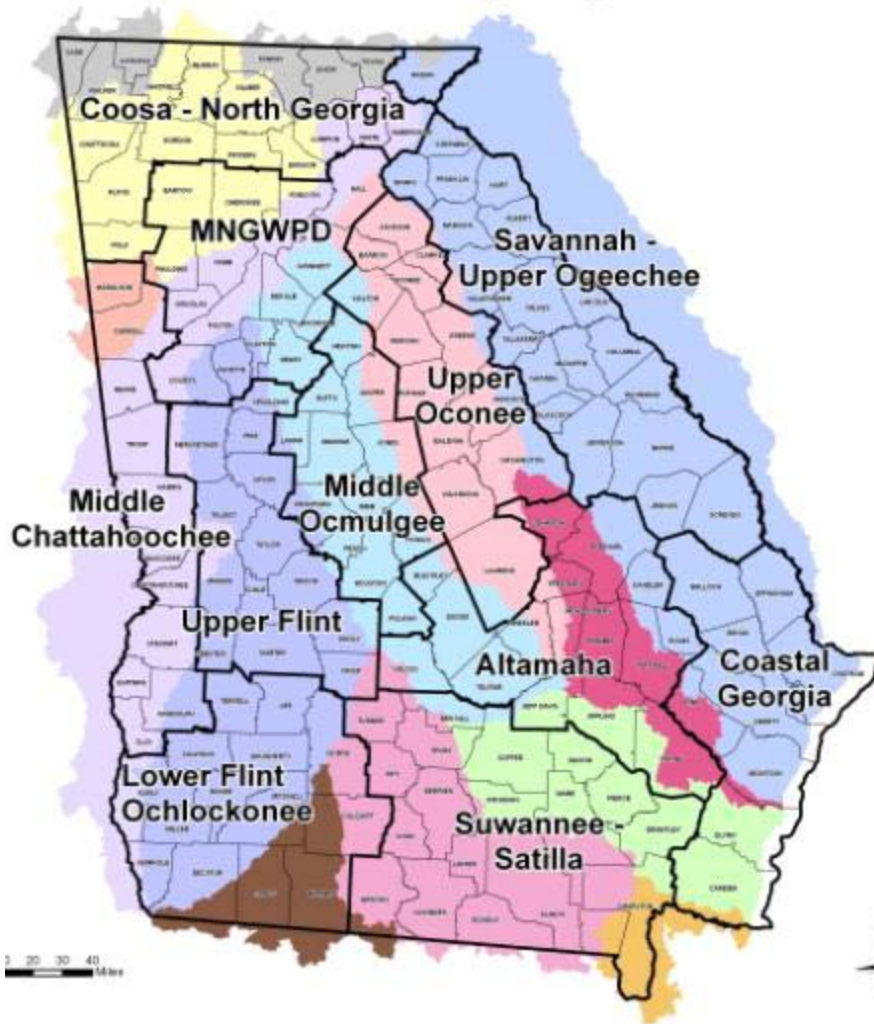
- State Water Plan calls for it:
 - “Plans shall include the following principal elements:
*Forecasts of 10-, 20-, 30-, and 40-year population expectations, **water demands**, wastewater returns, land surface types and distribution, and employment characteristics, developed in consultation with EPD.”*
(Section 14, p. 37)

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Why do Ag water use forecasting?

- Ag water use one of several forecasts that will be part of the State Water Plan
 - Population and economy
 - Energy use
 - Changes in land use
 - **Ag water use**
 - Water and wastewater demand

Water Planning Regions



10 planning regions and one district.

Political, not water boundaries.

Appointed 25 member boards responsible for planning.

EPD and other state agencies responsible for facts and figures.

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How will ag water forecasting be used?

- It will inform water planning councils about a major category of water use
- It will be used to establish *trends* in ag water demand, not as a permitting limit
- Forecasted ag water use trends will be compared with water quantity and quality resource assessments
- Forecasting will identify areas where we need more data

Irrigation Water Needs

- Agriculture's approach, like all forecasting, looks to trends from the past and considers foreseeable changes.

Forecasting Agricultural Water Demand

University of Georgia Research Team

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- Dr. Mark Risse, Extension - Bio and Ag Engineering

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Steps:

1. Determine “baseline” irrigated acreage.
2. Identify withdrawal sources (gw, sw, ponds).
3. Project major crop acres through 2050.
4. Calculate crop water needs for wet, normal, and dry years.
5. Project ag. water withdrawals 2011-2050.

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Where will irrigation occur?

- Farmers will continue to use their investments in existing hardware.
- Farmers will expand irrigation near existing irrigated fields.
 - Those areas have proven water supplies, suitable soils, established farm support
 - All Georgia Counties have room for irrigation growth.
- Projections based on mapped irrigation locations.

What Water Sources?

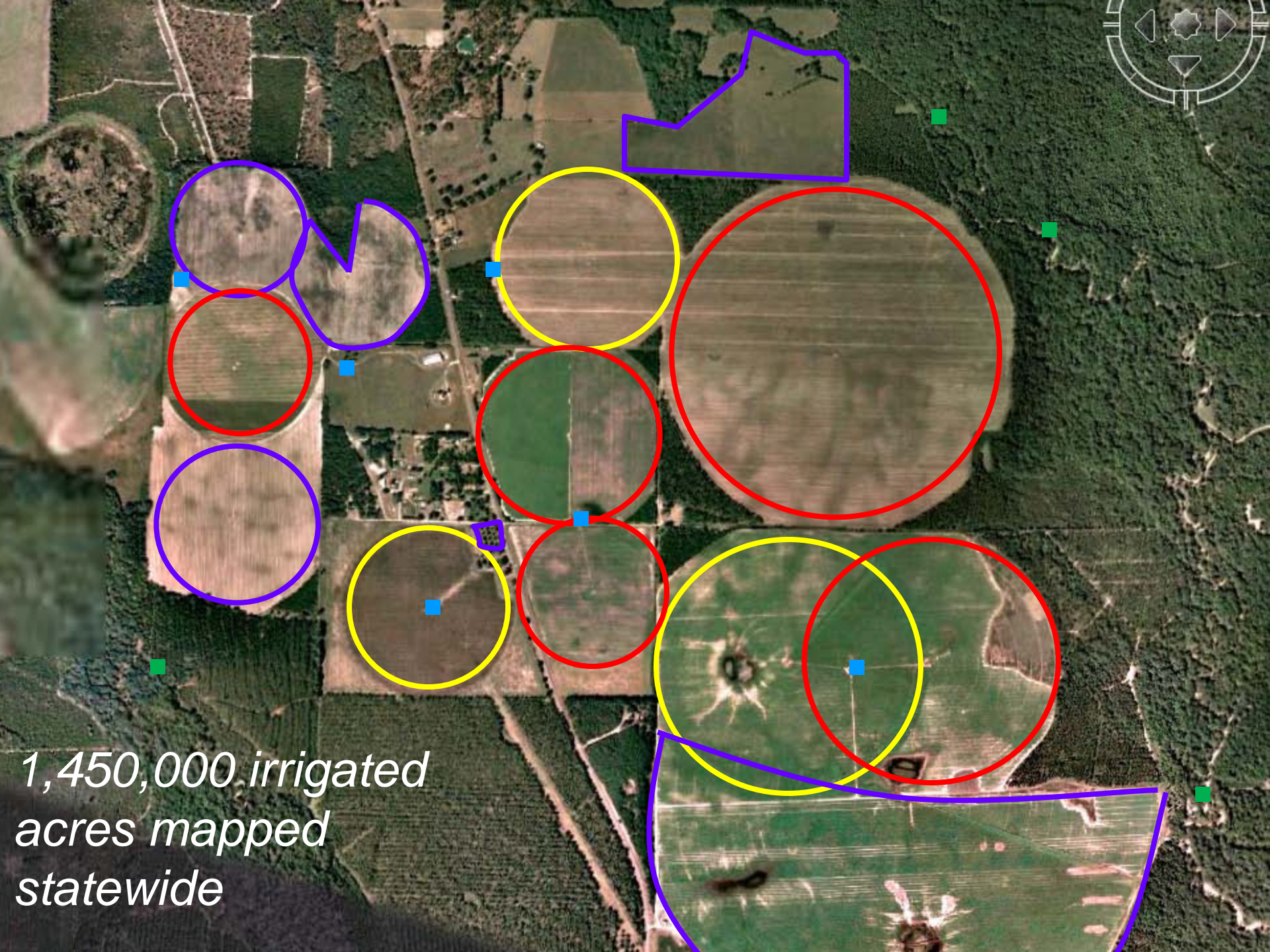
- Continue use of existing sources, if unlimited.
 - Groundwater dependency growing.
 - Pond storage capacity has also been increased.
 - Direct stream withdrawals unreliable.
- Projections assume 2008 water supply ratio (70% GW: 30% SW) will continue into the future.

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Data Sources for baseline acres, water sources

- Farmer supplied locations
- SWCC acreage mapping for irrigation meters
- Flint River Policy and Planning Center (ASU)
- EPD Ag permit database
 - Withdrawal type (gw, sw, wtp)
- EPD acreage mapping
 - Flint River Basin (2006 Regional Plan and Auction)
 - 24 Coastal Counties (Saltwater Intrusion Mgmt. Plan)
- Additional aerial photo inspection by UGA
 - National Agricultural Imagery Program ('05-'07)





*1,450,000 irrigated
acres mapped
statewide*

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What crops will be irrigated?

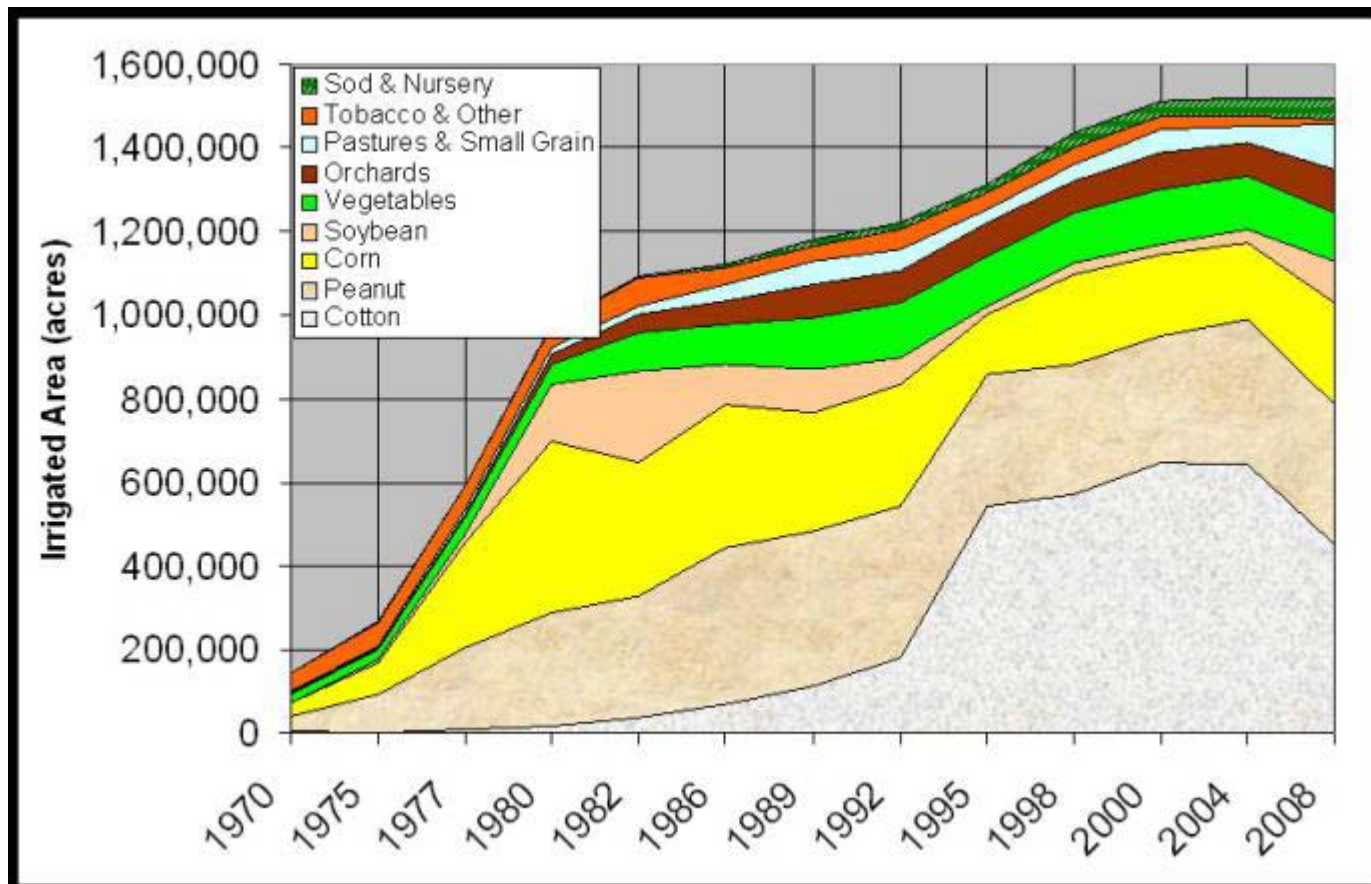
- Demand for commodities is dictated by national and international supply and demand.
- Georgia farmers utilize their experience and resources selecting commodities that favor them economically.
 - USDA Projections
 - Southeast Model
 - Georgia Model
- Data Trends

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Data Sources for crop projections

- USDA Census of Ag and Annual Crop Reports
- USDA 10-year projections (cot, corn, soy, pecan)
- Food and Agricultural Policy Institute (peanut)
- 2007 UGA Farm Gate Report (specialty crops)

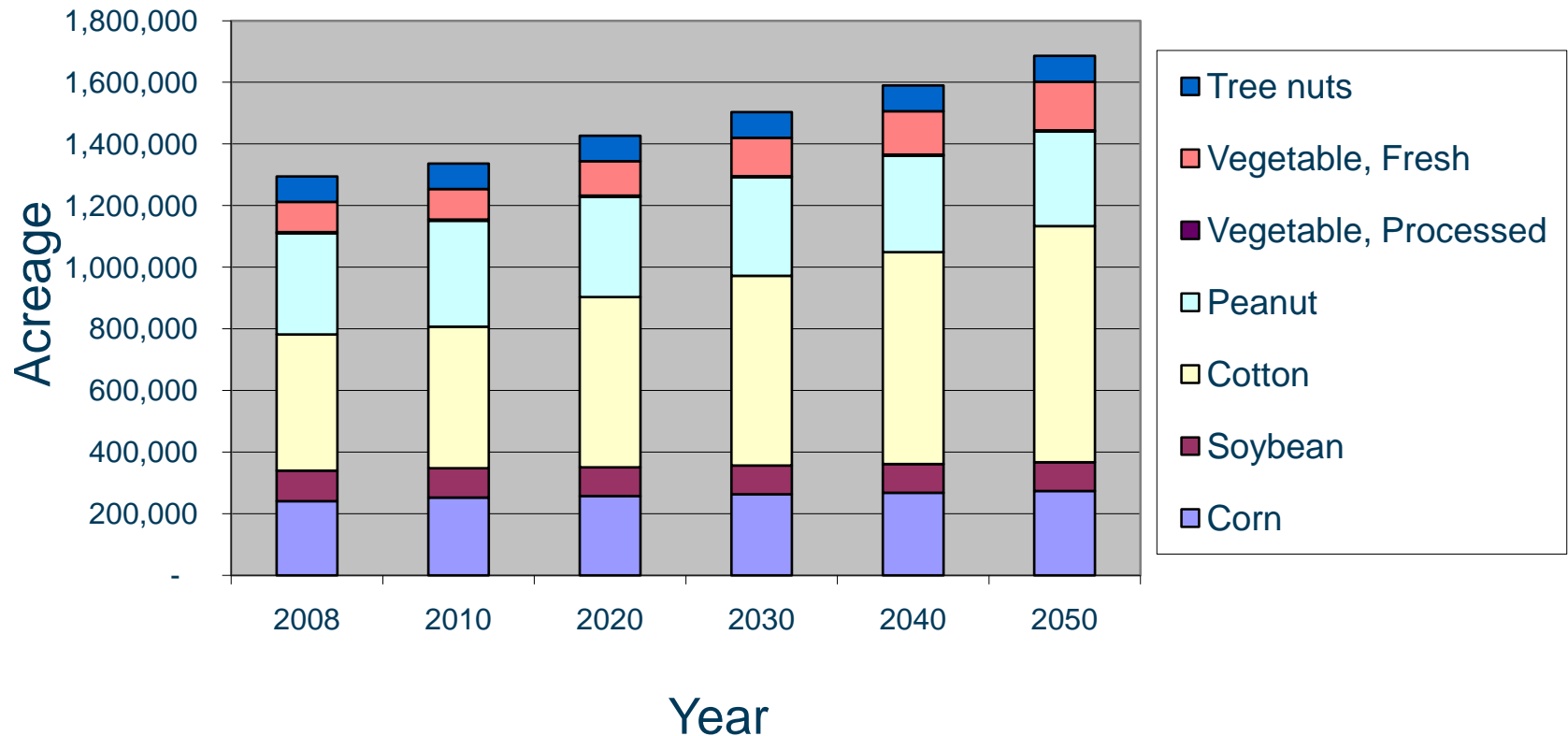
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Historically: traditional row crops – cotton, peanut, corn, and soybean dominate. Economically: pecans, vegetables and fruit, nurseries and other specialty crops claim a significant share of irrigation water use.

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Georgia Irrigated Acres Projection*



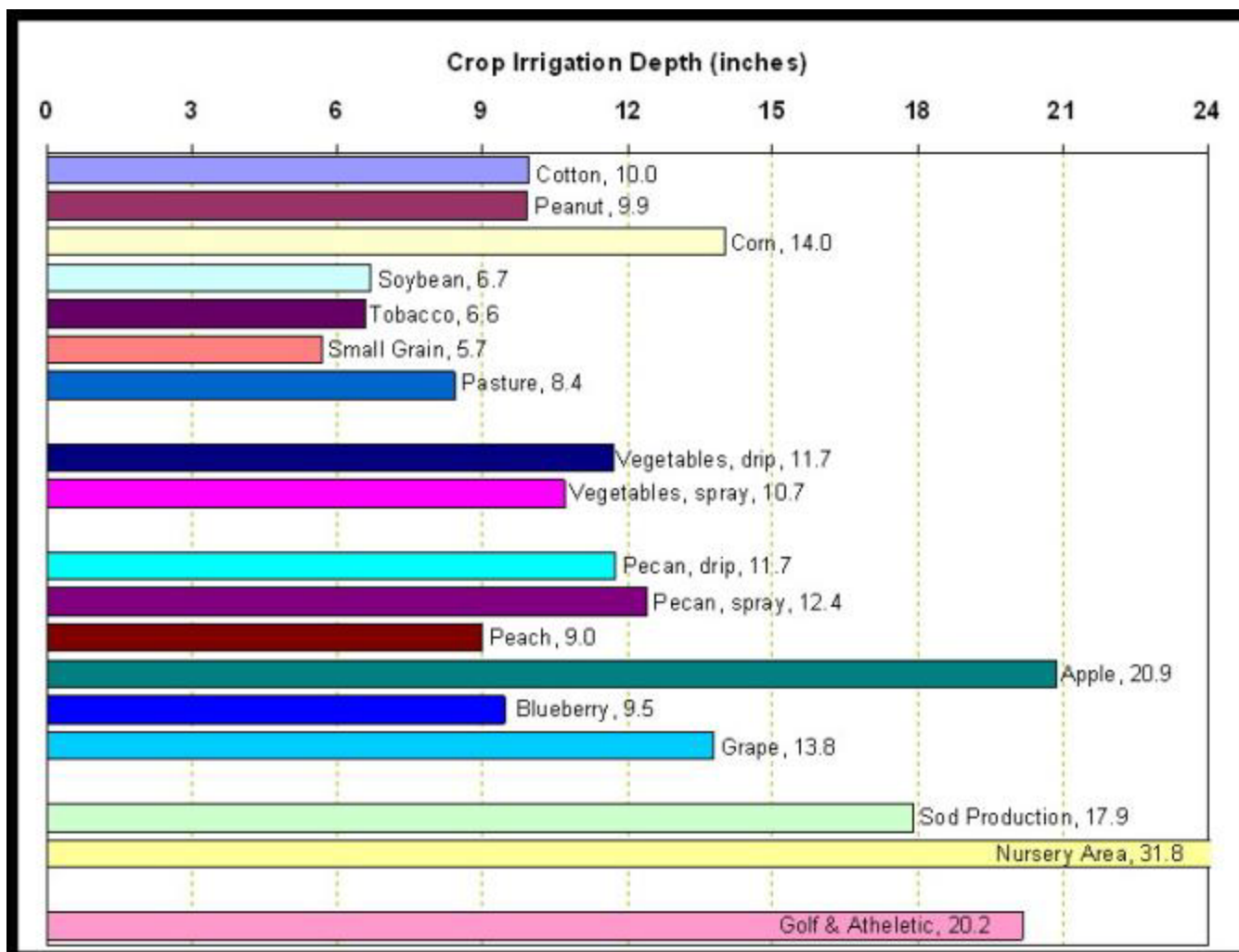
* The national model, which includes the USDA 10-year projections, predicts growth in acreage for most of Georgia's major crops.

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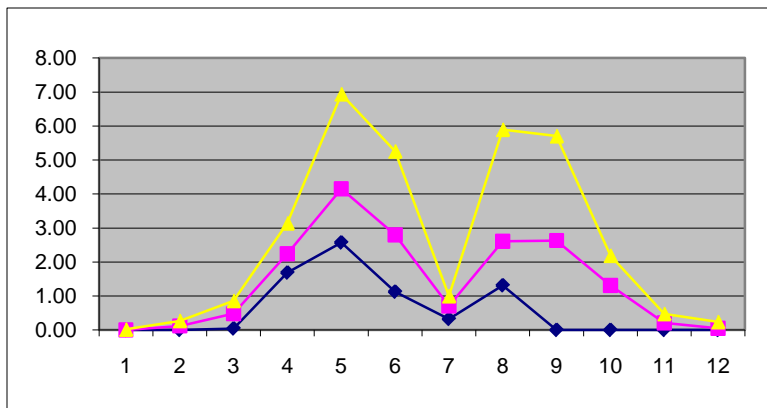
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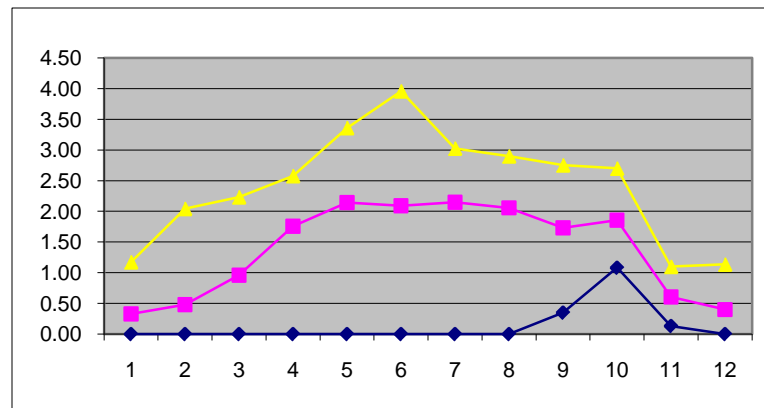
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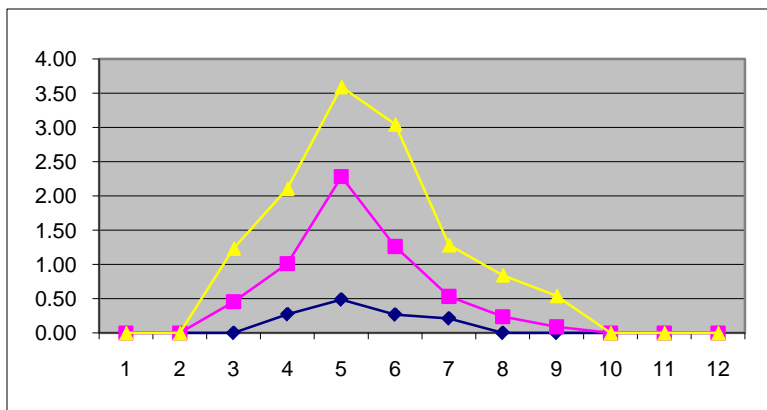
Sources: Harrison, K.A.. 2009. Georgia Irrigation Survey for 2008. CES Misc. Pub. January 22, 2009. Cooperative Extension Service, Athens, GA. (graph) and Flanders, A. et al. 2009 Georgia economic losses due to 2008 drought as reported in FSA Loss Assessment Summary. Center Report: CR-09-01, January, 2009. UGA Center for Agribusiness and Economic Development, Athens Ga.



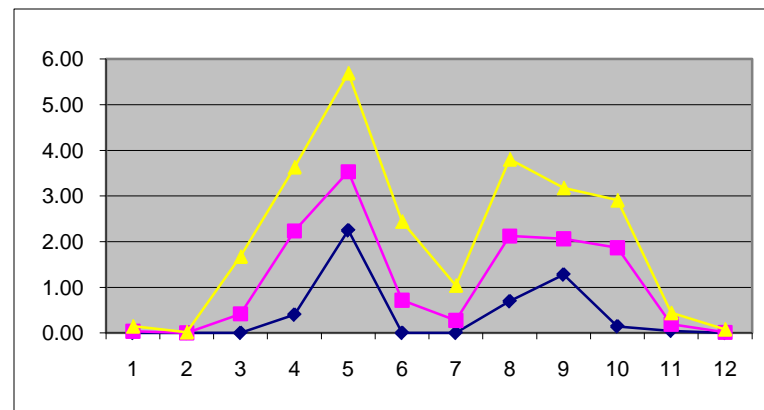
Sweet corn



Turfgrass sod



Melons



Squash

- Monthly water use for selected crops in dry normal, wet years.

- Observations 1999-2004, Ag Water Pumping, values in inches



How much water?

- Weather dependent.
- Irrigation replaces rainfall deficit.
 - Weekly water needs known
 - Assume weather patterns as past 60 years.
 - Use that record to look water needs for all growing seasons.
- Projections compute irrigation depth to support full yield, with amounts computed for wet, average and dry growing seasons.

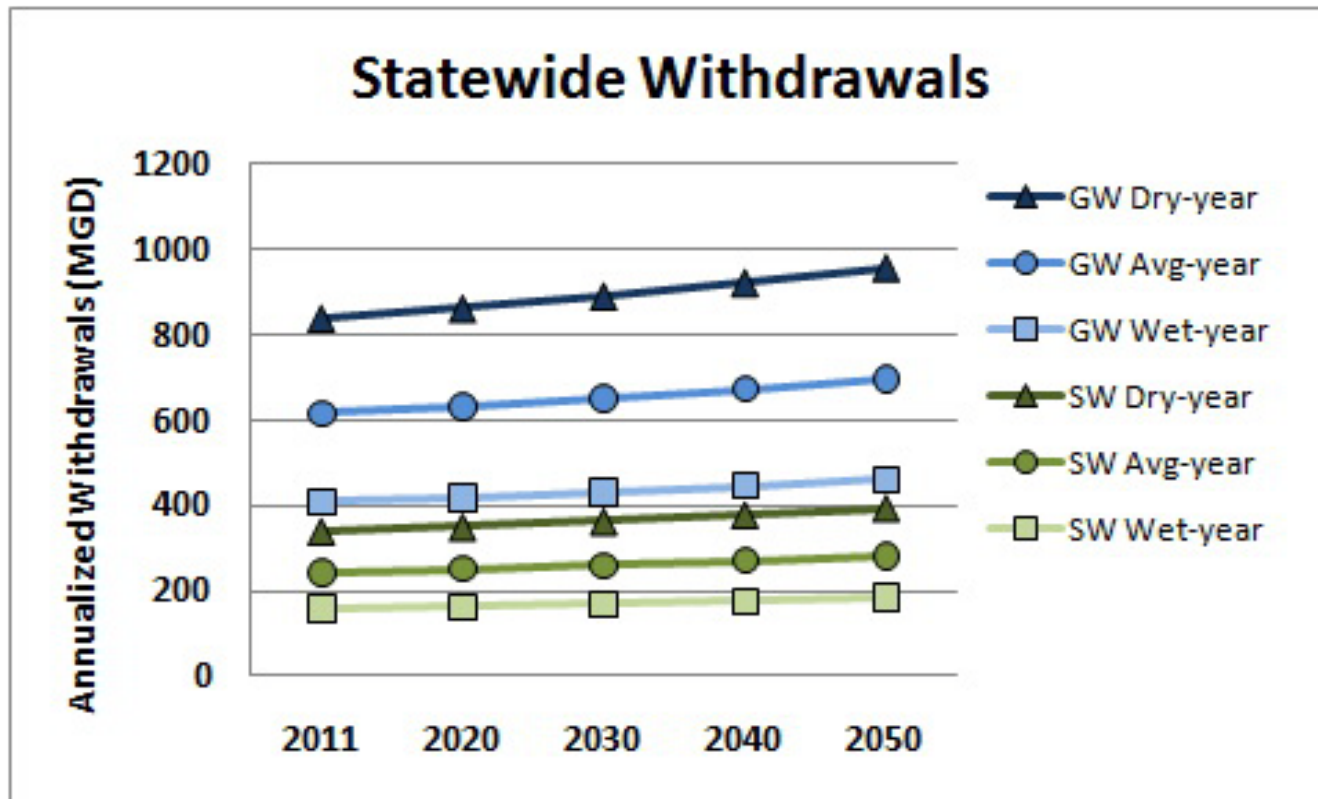
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Pulling the pieces of the projections together.

- Water withdrawals for a given water source in a month within a county are the sum over all crops =
 - Projected irrigated area of each crop (acres) X
 - Predicted monthly irrigation depth for the crop (inch) X
 - Fraction of water from the water source.
- Projections made for a range of weather.
- Results converted from acre-inches to MGD

The projections ...

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Projected **statewide** agricultural irrigation water demand through 2050 from Surface & Groundwater Sources.

Forecasting Agricultural Water Demand

Observations on Forecasted Demand

- Slight increases are expected for Georgia's Ag irrigation water use over the next 40 years.
- The wide range in demand projections between wet and dry years points out the challenge of meeting the demand.
 - In drought years farmers will need most of their crop water from aquifers and surface storage.
 - In wet years, they need little more than a supplement to rainfall for most crops.

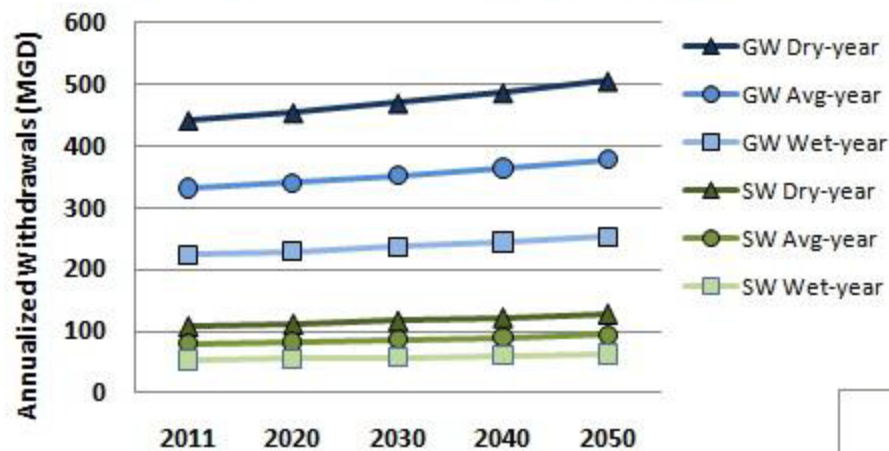
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Observations on Forecasted Demand

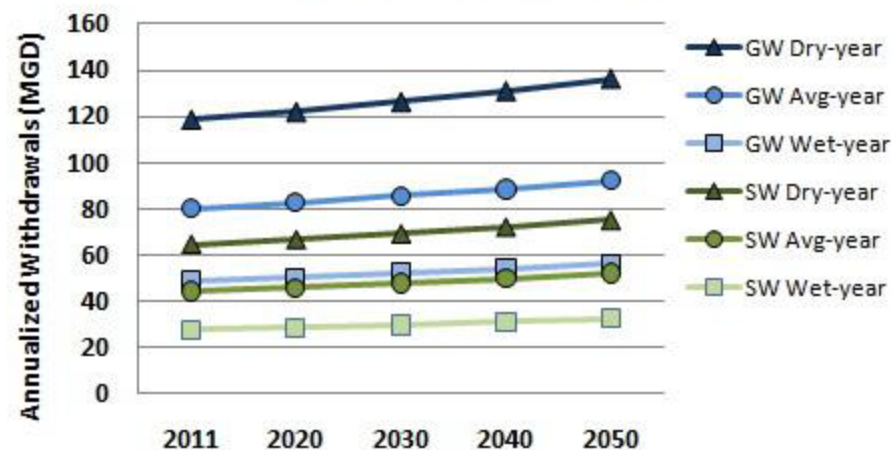
- Much less water will be withdrawn from surface streams and storage statewide than from aquifers.
 - In part this reflects observations that farmers who rely on surface water are unable to meet all of their demand in dry years.

Forecasting Agricultural Water Demand

Lower Flint - Ochlockonee WPR



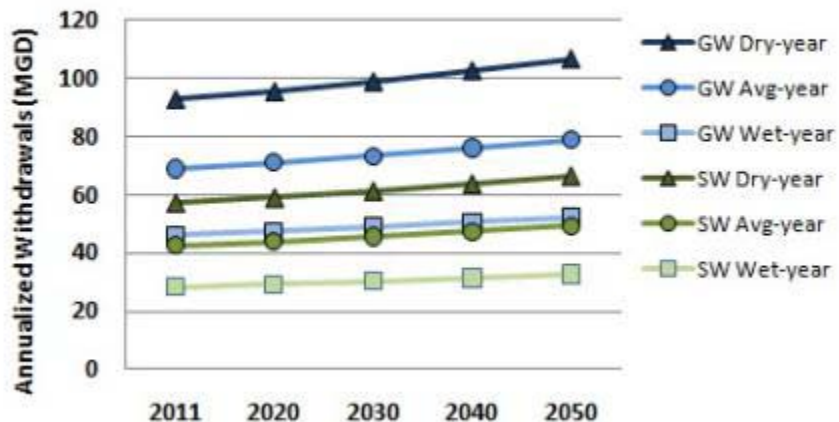
Suwannee - Satilla WPR



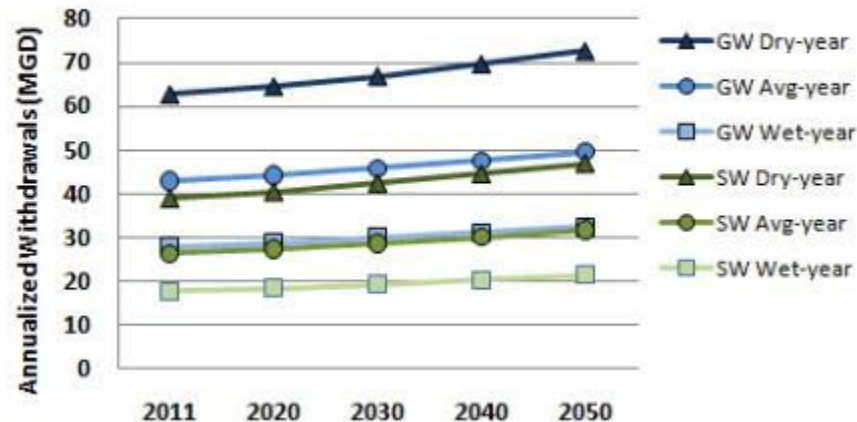
Projected agricultural irrigation water demand in primary production areas through 2050.

Forecasting Agricultural Water Demand

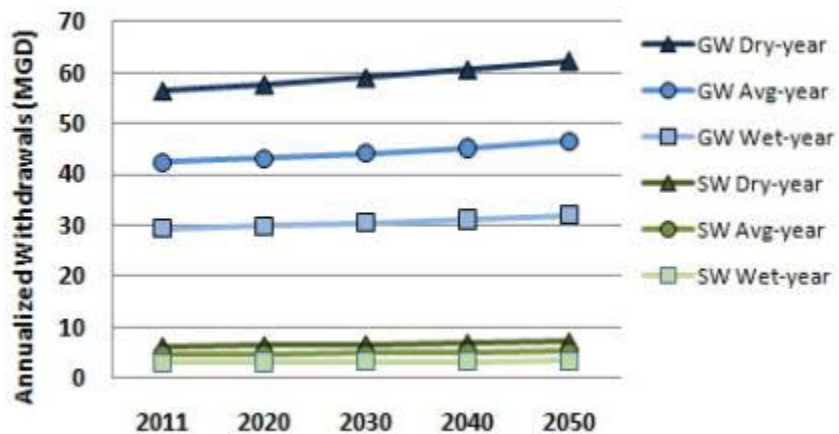
Upper Flint WPR



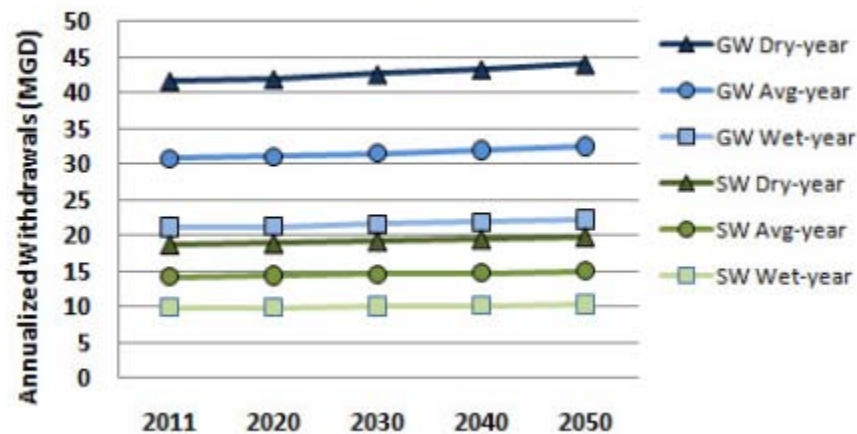
Altamaha WPR



Middle Ocmulgee WPR



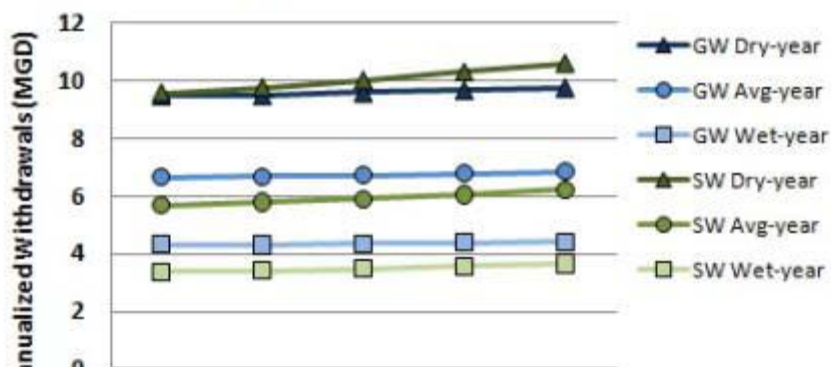
Savannah - Ogeechee WPR



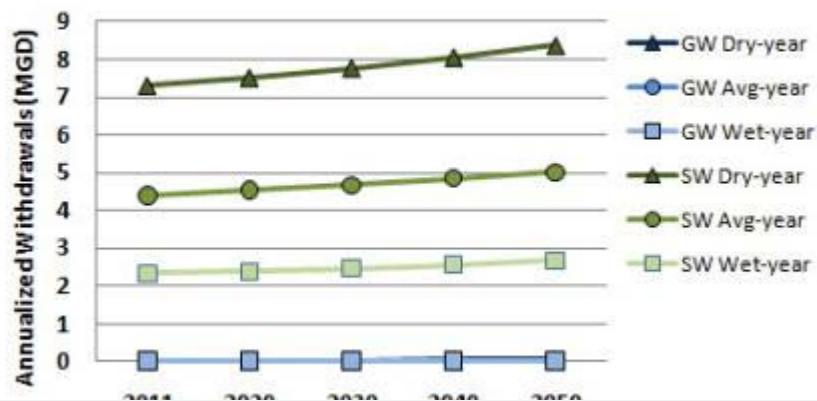
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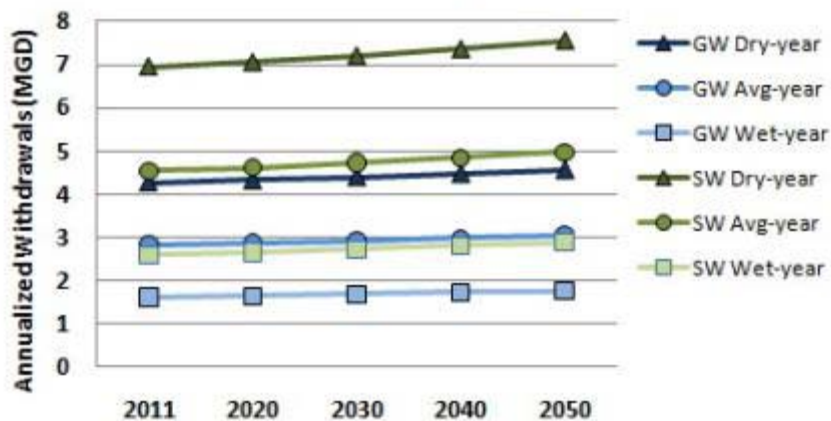
Upper Oconnee WPR



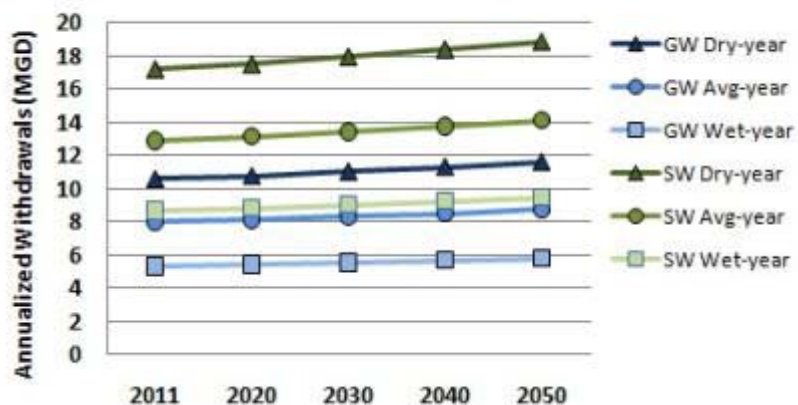
Coosa - North Georgia WPR



Coastal Georgia WPR



Middle Chattahoochee WPR



Projected agricultural irrigation water demand in **minor production areas** through 2050.

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Conclusions

1. Ag water use will continue to increase throughout planning horizon, but...
2. Forecasting models diverge after 2018, but closely simulate existing application depths
3. Increases in water use driven by forecasted crop distributions
4. Agricultural will continue to be major water use sector

Forecasting Agricultural Water Demand

What is NOT included in Ag Forecasts

1. Commercial & Industrial Landscape irrigation
2. Home lawn & landscape irrigation
3. Golf courses and athletic fields (sod farms producing turf for retail sale are included)
4. Retail nurseries and greenhouses (large production nurseries and greenhouses are included)*
5. Non-irrigation water use on farms including livestock water, processing of farm products and aquaculture*