Groundwater Management Strategies, Monitoring and Conditions

RBC Discussion and Decision Points

1. Discuss Groundwater Management Strategies for Evaluation

Objective: Identify groundwater management strategies (if any) and scenarios to evaluate using the groundwater model.

2. Discuss Monitoring in Groundwater Areas of Concern

Objective: Review existing monitoring network and consider making Plan recommendations for enhanced monitoring, especially in the identified Groundwater Areas of Concern.

3. Discuss Possible Groundwater Conditions

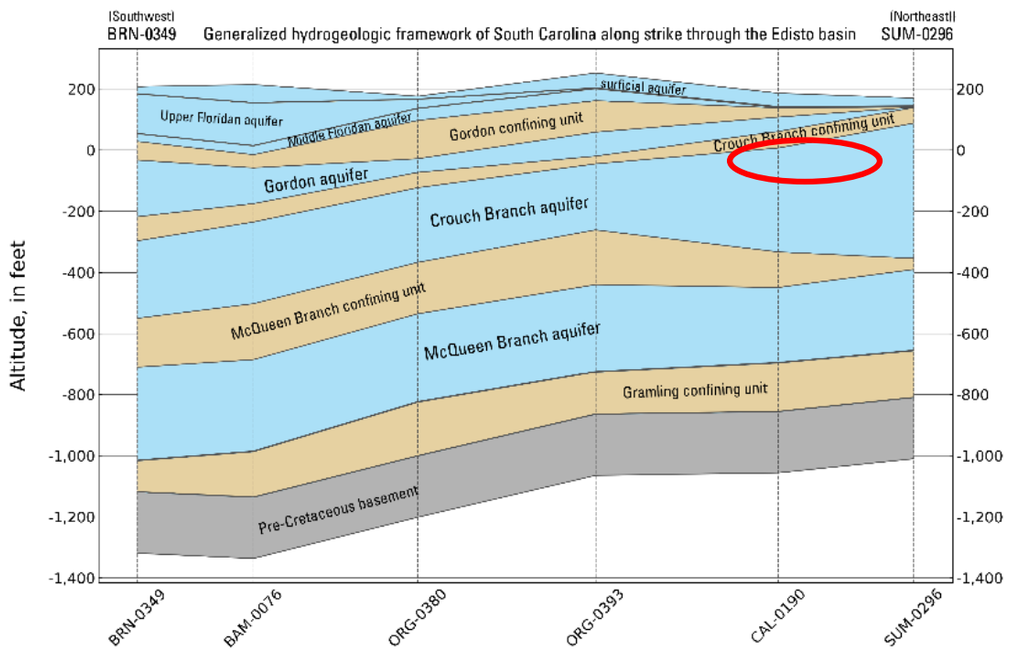
Objective: Review and discuss if any groundwater conditions should be established as part of the Plan.

Adopted Motion from March RBC Meeting

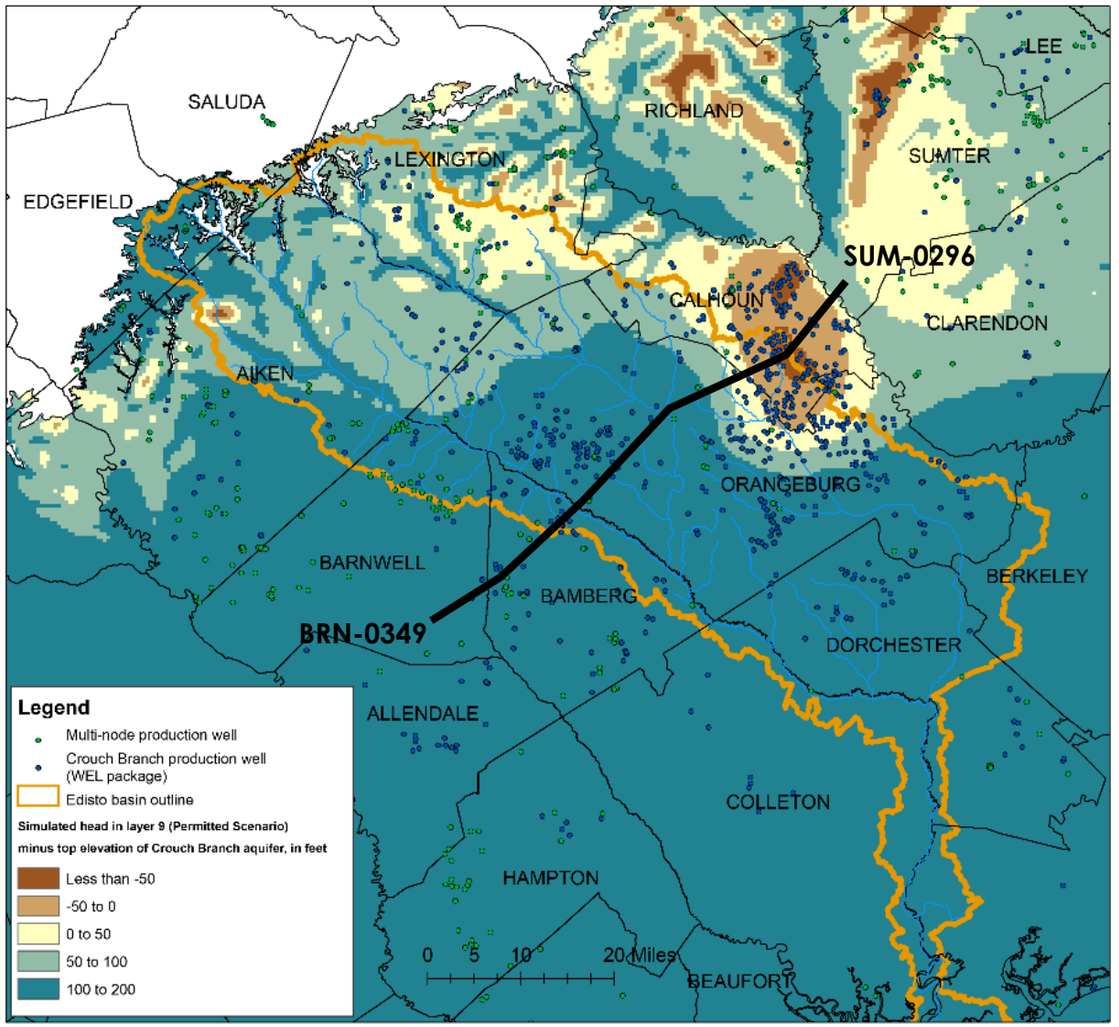
- **The Edisto RBC recommends establishing Groundwater Areas of Concern in regions where groundwater data and/or groundwater modeling predict water levels drop below the top of the aquifers.**

Potential Groundwater Area of Concern – Calhoun County

- An area where current or future groundwater withdrawals from an aquifer are causing or are expected to cause unacceptable impacts to the resource or to the public health and well-being.



Simulated 2070 heads below top of aquifer in Crouch Branch (layer 9) Permitted Scenario



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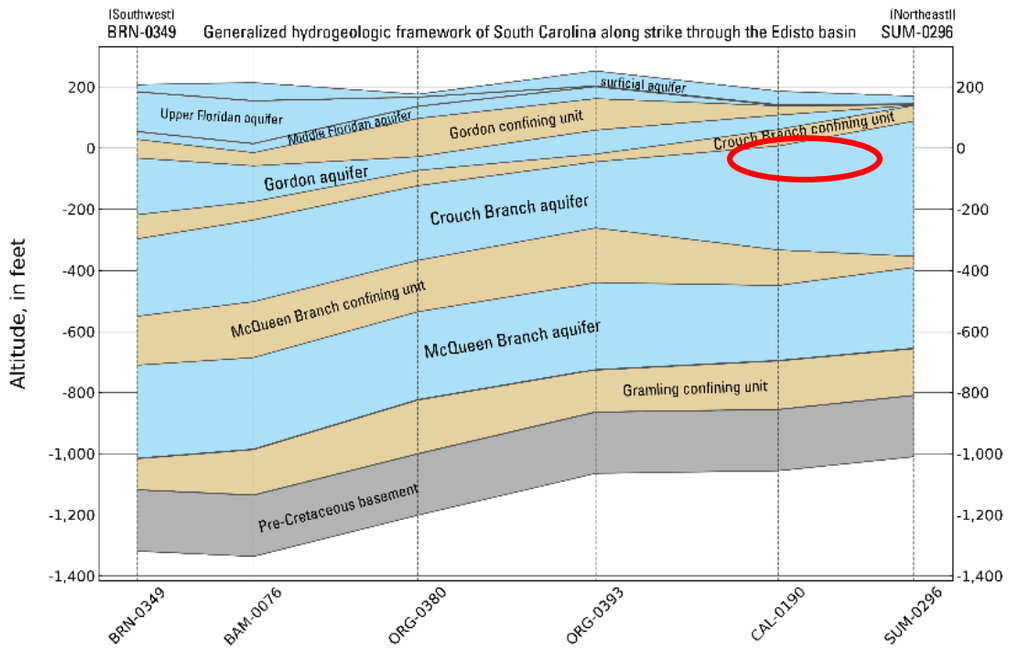
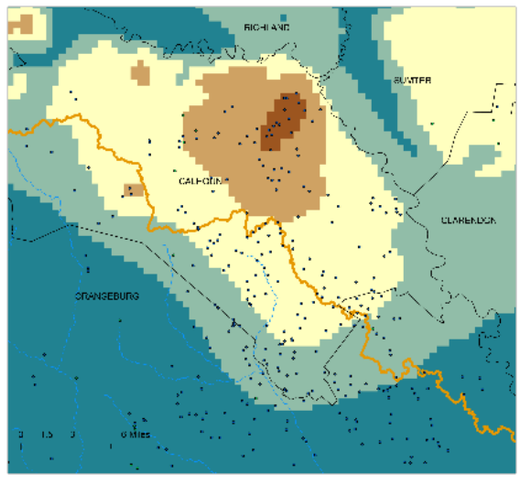
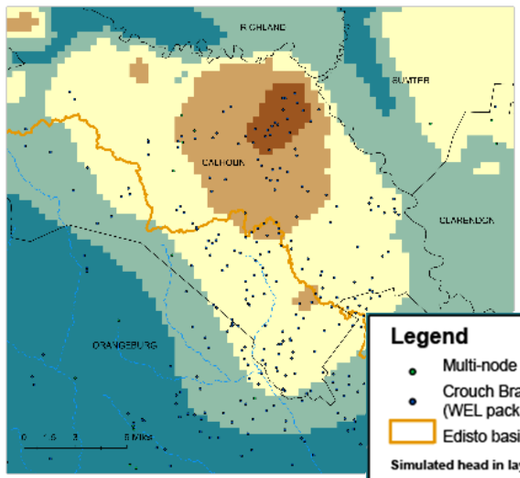


Simulated 2070 heads below top of aquifer in Crouch Branch (layer 9)

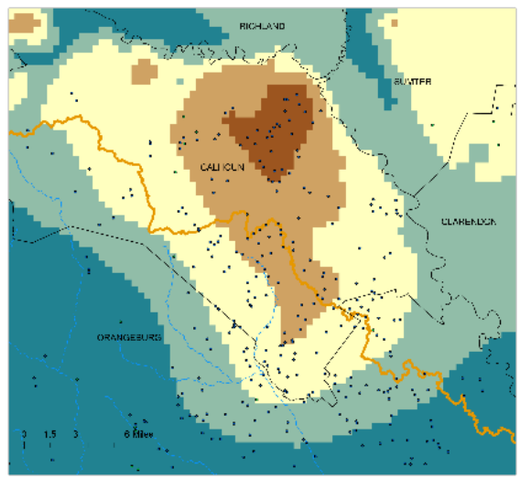
Current Scenario



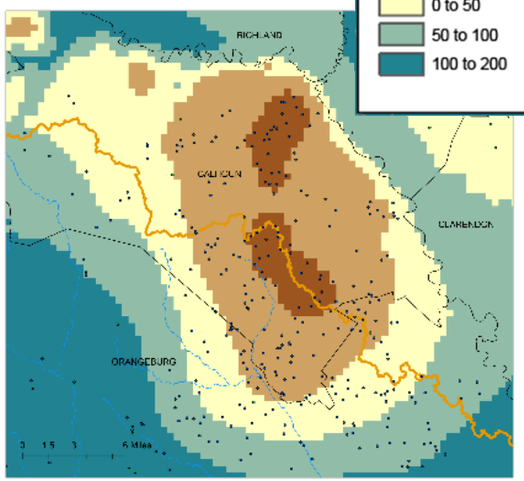
Moderate Growth Scenario

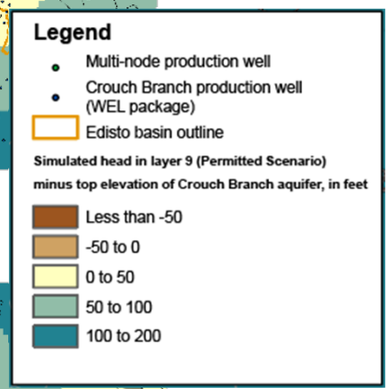


High Growth Scenario



Permitted Scenario



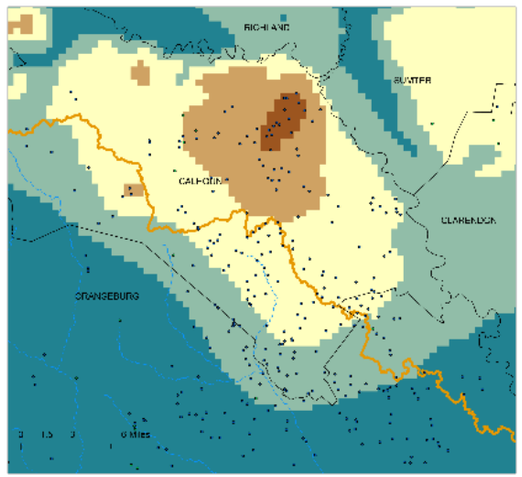


Potential Groundwater Area of Concern – Calhoun County

- An area where current or future groundwater withdrawals from an aquifer are causing or are expected to cause unacceptable impacts to the resource or to the public health and well-being.
- **Potential impacts:**
  - Land subsidence
  - Compaction of the aquifer and depletion of the resource
  - Reduced well yields
  - Dry wells, including dry domestic wells
  - Increased pumping costs

Simulated 2070 heads below top of aquifer in Crouch Branch (layer 9)

Current Scenario



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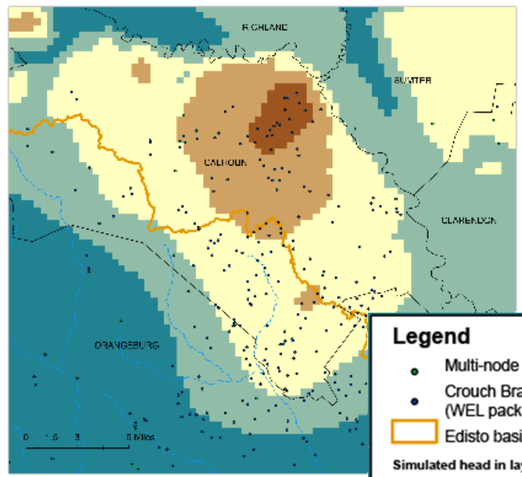
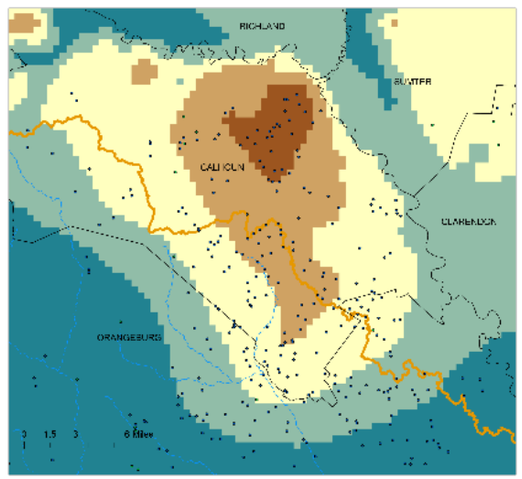
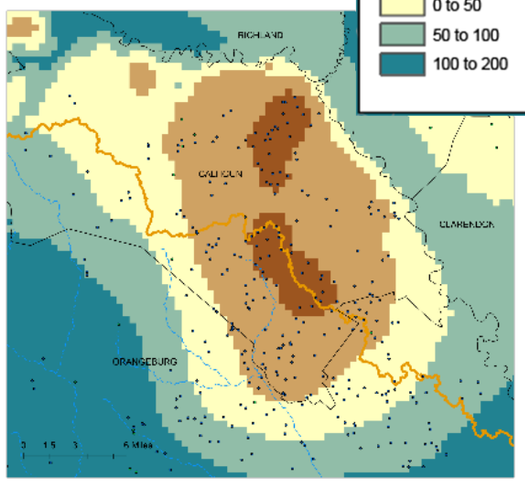


High Growth Scenario



Permitted Scenario



Legend

- Multi-node production well
- Crouch Branch production well (WEL package)
- Edisto basin outline

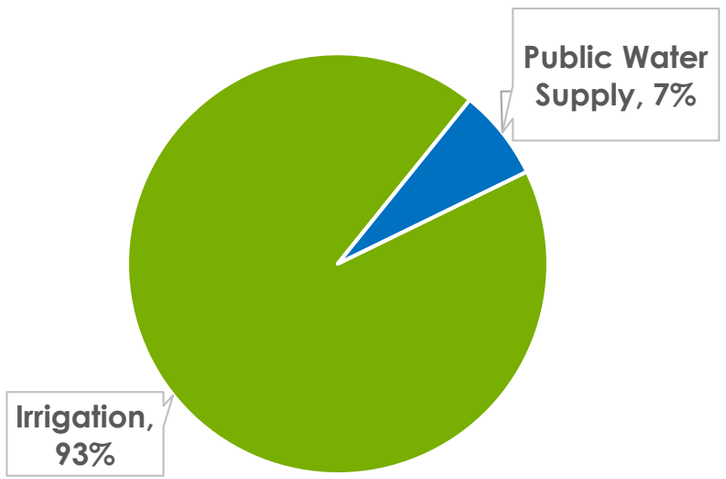
Simulated head in layer 9 (Permitted Scenario) minus top elevation of Crouch Branch aquifer, in feet

- Less than -50
- -50 to 0
- 0 to 50
- 50 to 100
- 100 to 200

Potential Groundwater Area of Concern – Calhoun County

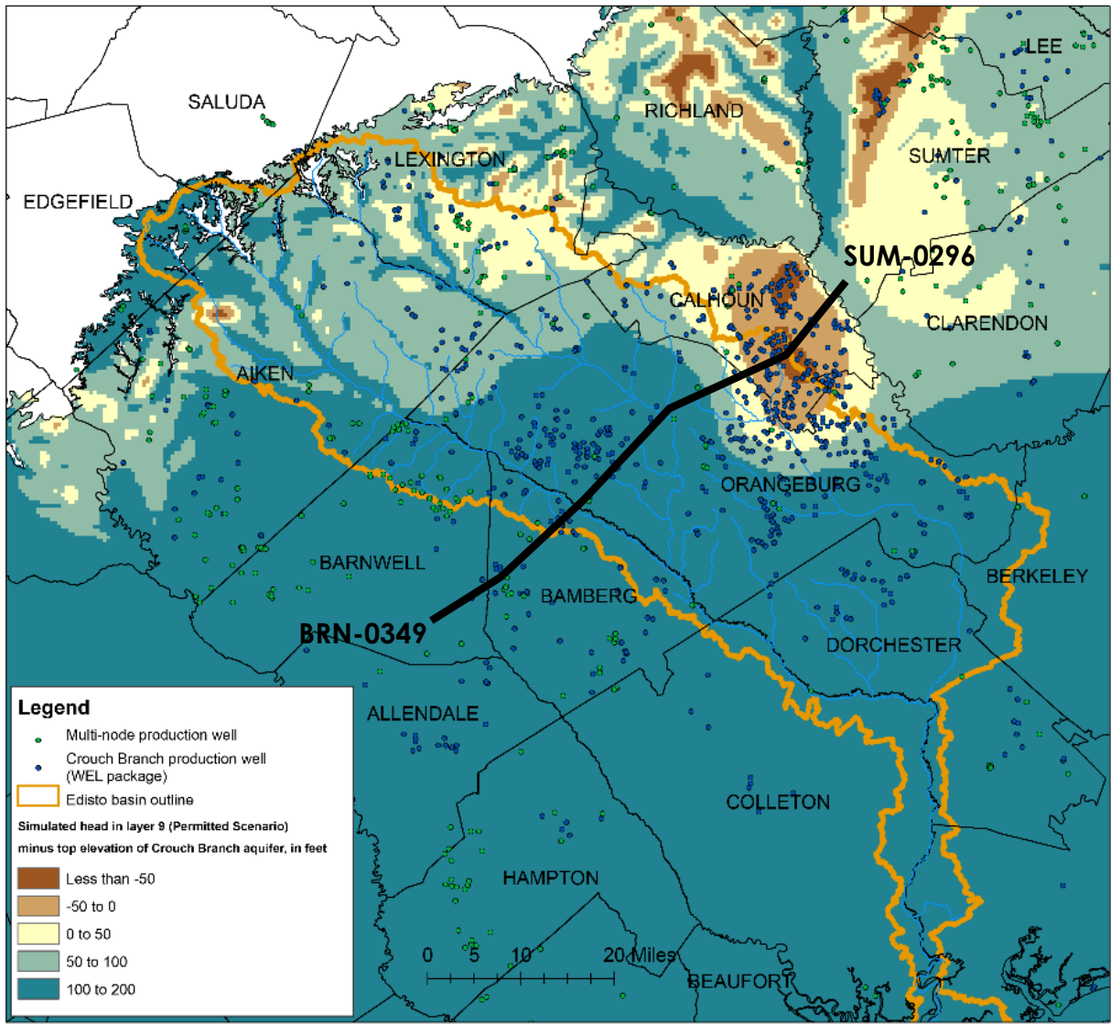
- An area where current or future groundwater withdrawals from an aquifer are causing or are expected to cause unacceptable impacts to the resource or to the public health and well-being.

Calhoun County 2018 Groundwater Use



Source: DHEC

Simulated 2070 heads below top of aquifer in Crouch Branch (layer 9) Permitted Scenario



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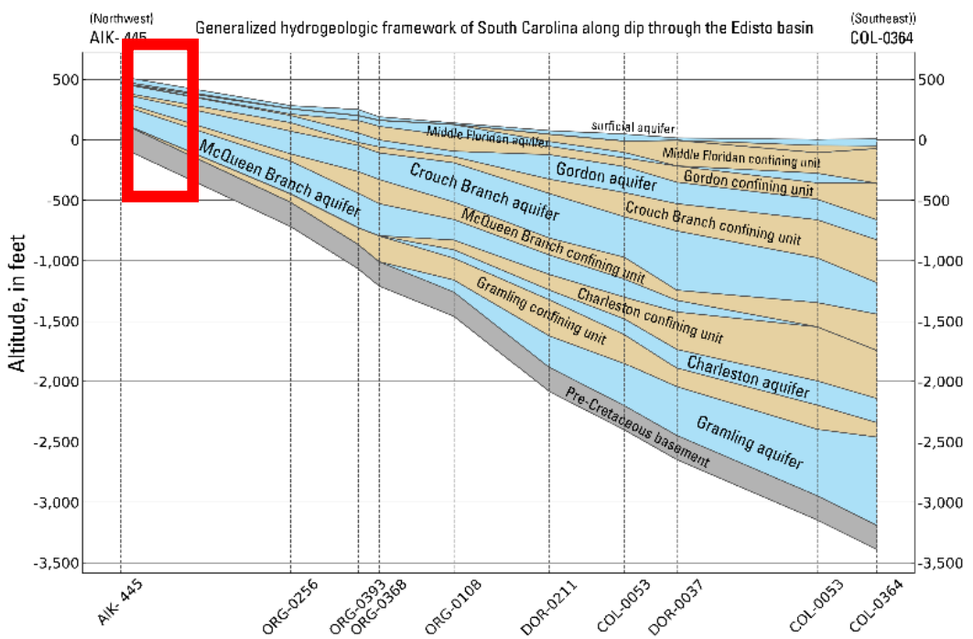
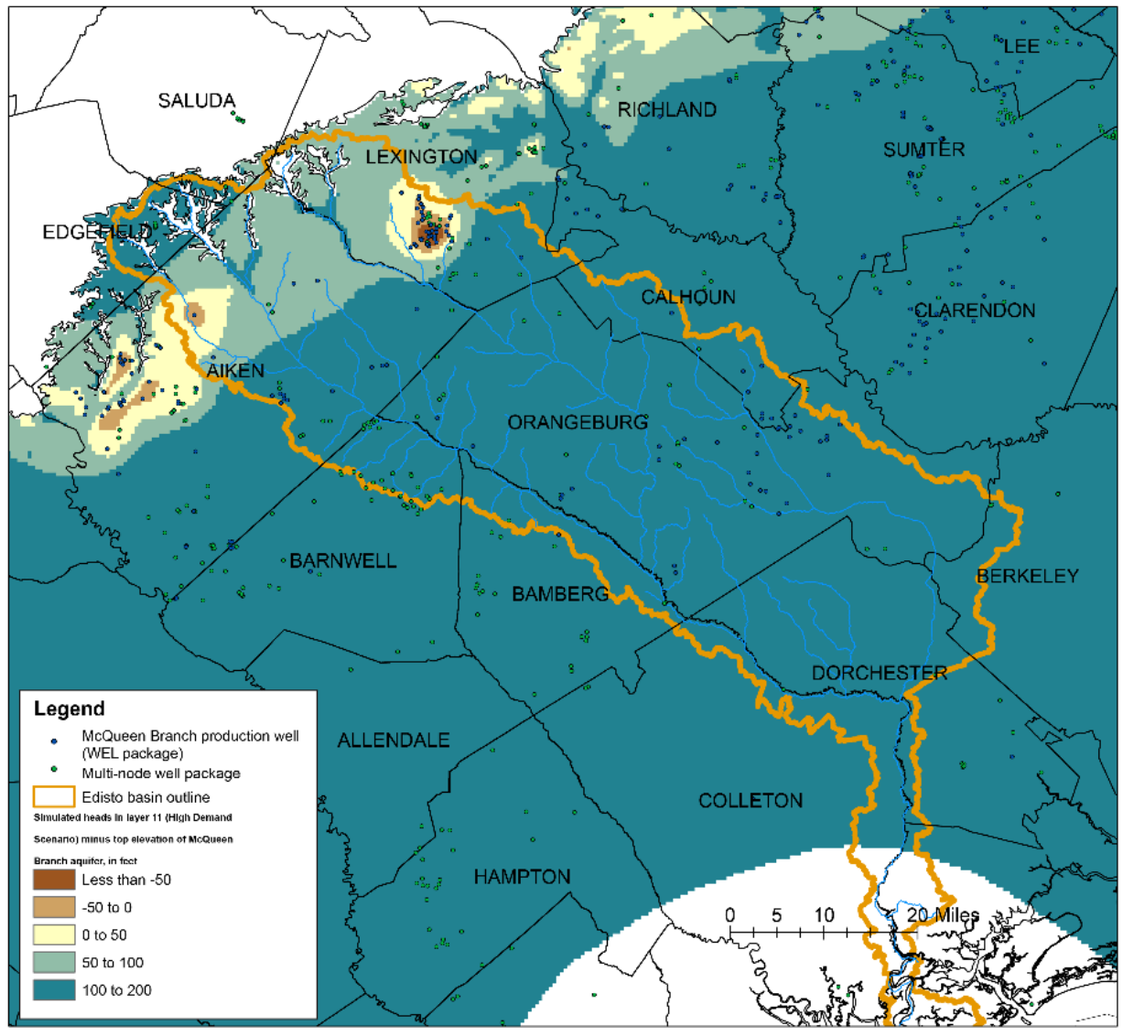
Potential Groundwater Area of Concern – Lexington County

- An area where current or future groundwater withdrawals from an aquifer are causing or are expected to cause unacceptable impacts to the resource or to the public health and well-being.



Simulated 2070 heads below top of aquifer in McQueen Branch (layer 11) Moderate Growth Scenario



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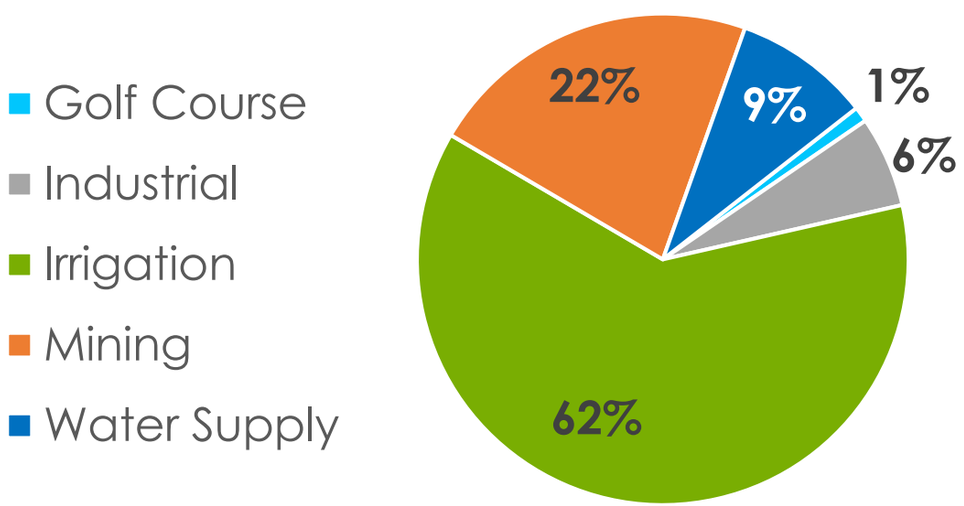
Potential Groundwater Area of Concern – Lexington County

- An area where current or future groundwater withdrawals from an aquifer are causing or are expected to cause unacceptable impacts to the resource or to the public health and well-being.

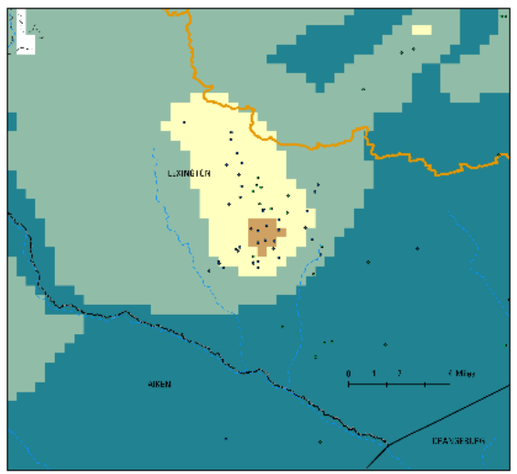
Lexington County 2018 Groundwater Use



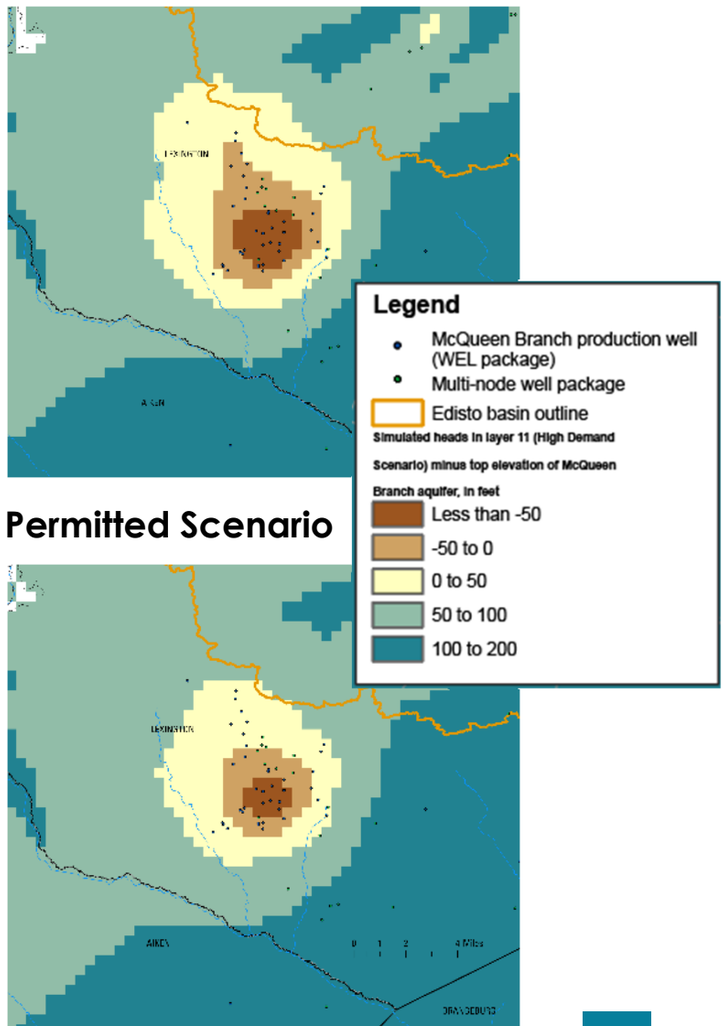
Source: DHEC

Simulated 2070 heads below top of aquifer in McQueen Branch (layer 11)

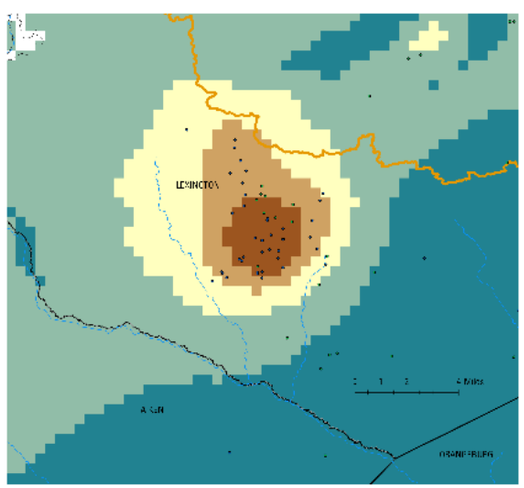
Current Scenario



Moderate Growth Scenario



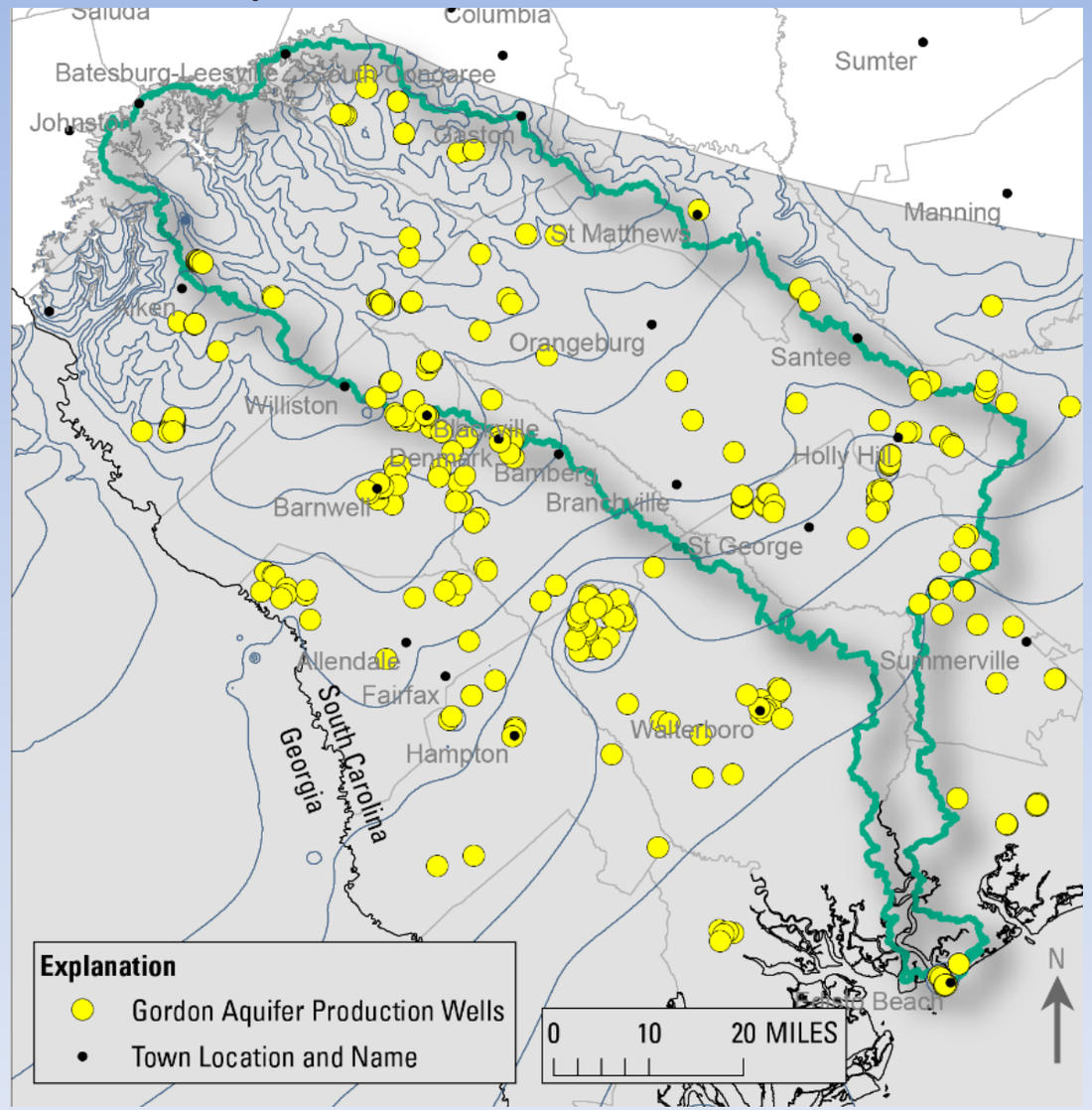
High Growth Scenario



Permitted Scenario

Provisional – All data is considered provisional and subject to revision.

High Growth Scenario - 2070 – **Gordon Aquifer** (layer 7)
Simulated Pot Map Contours and Production Wells



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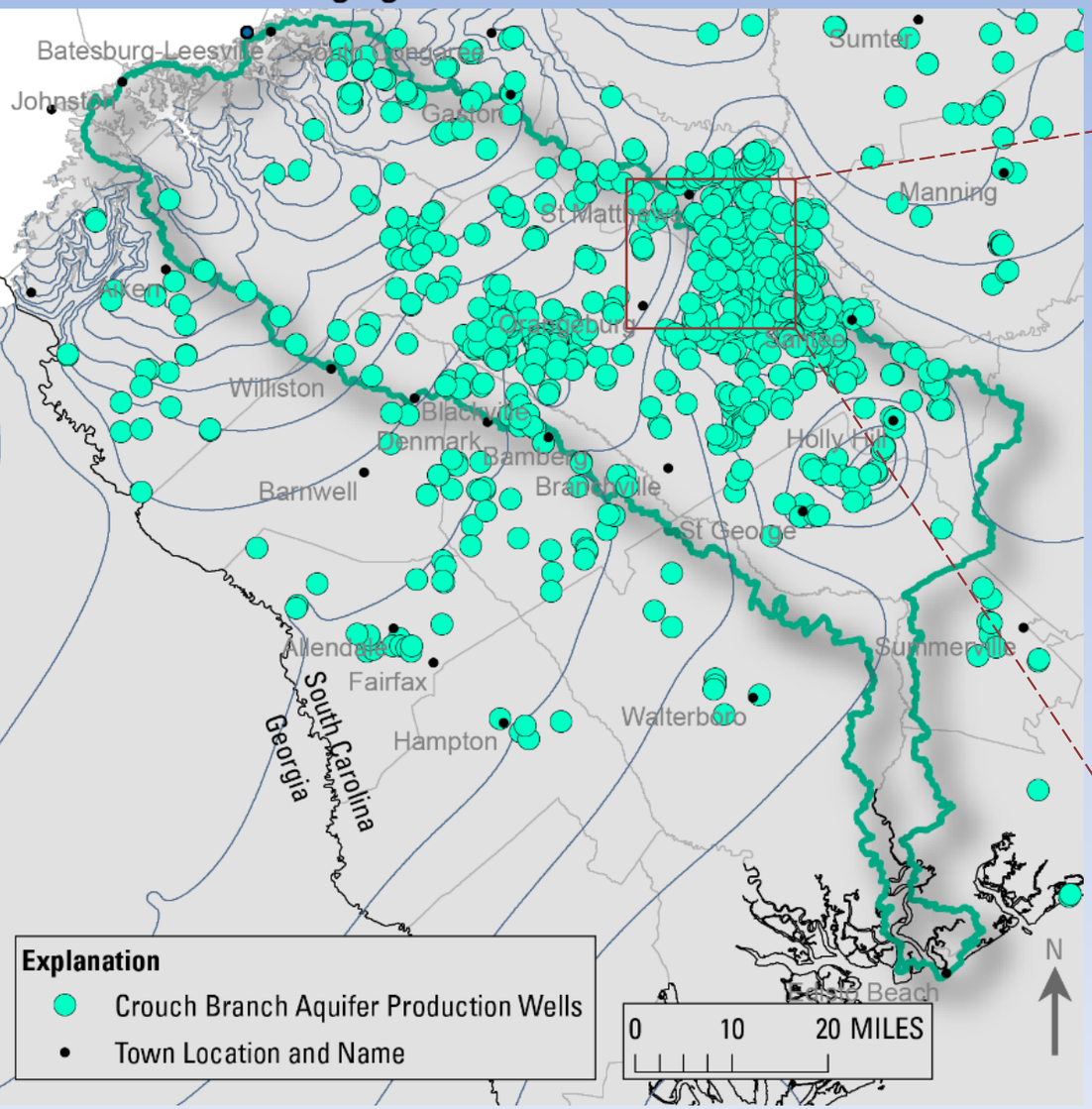
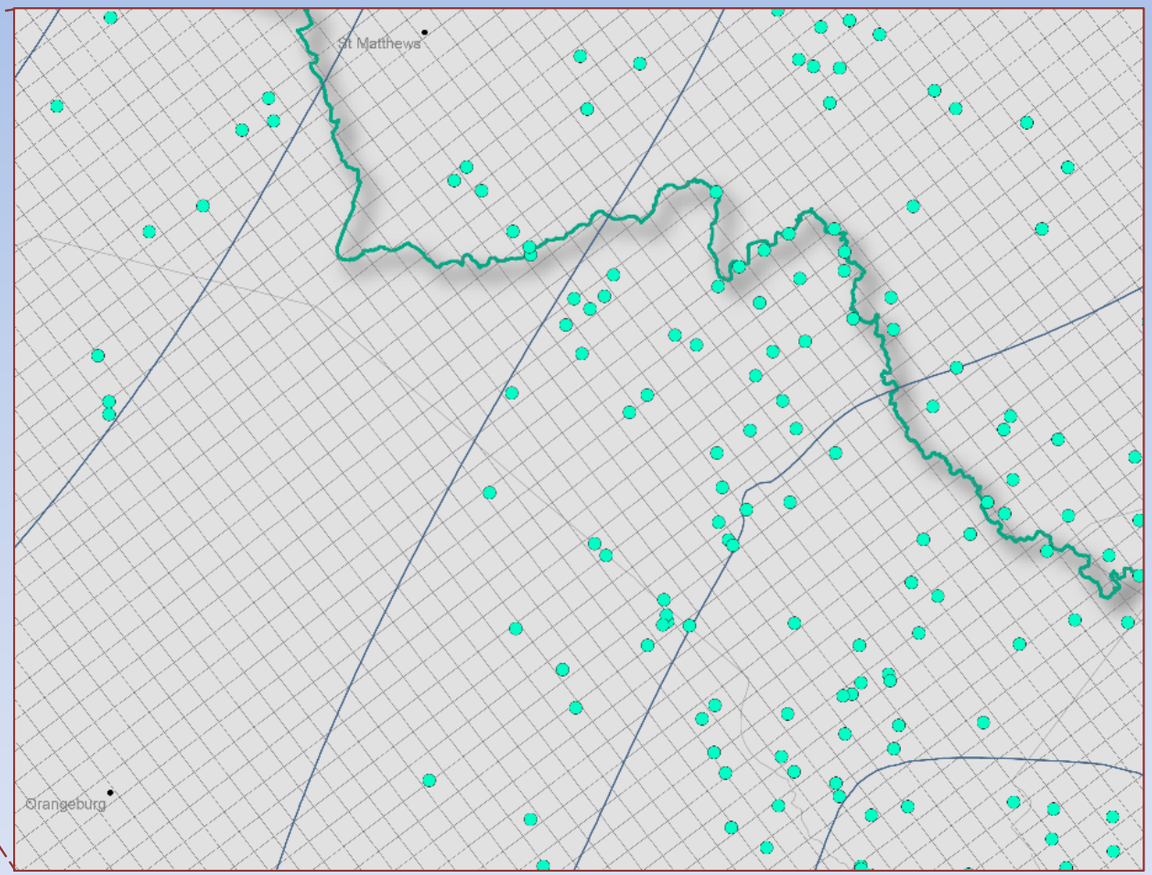
High Growth Scenario - 2070 – **Crouch Branch Aquifer** (layer 9) Simulated Pot Map Contours and Production Wells





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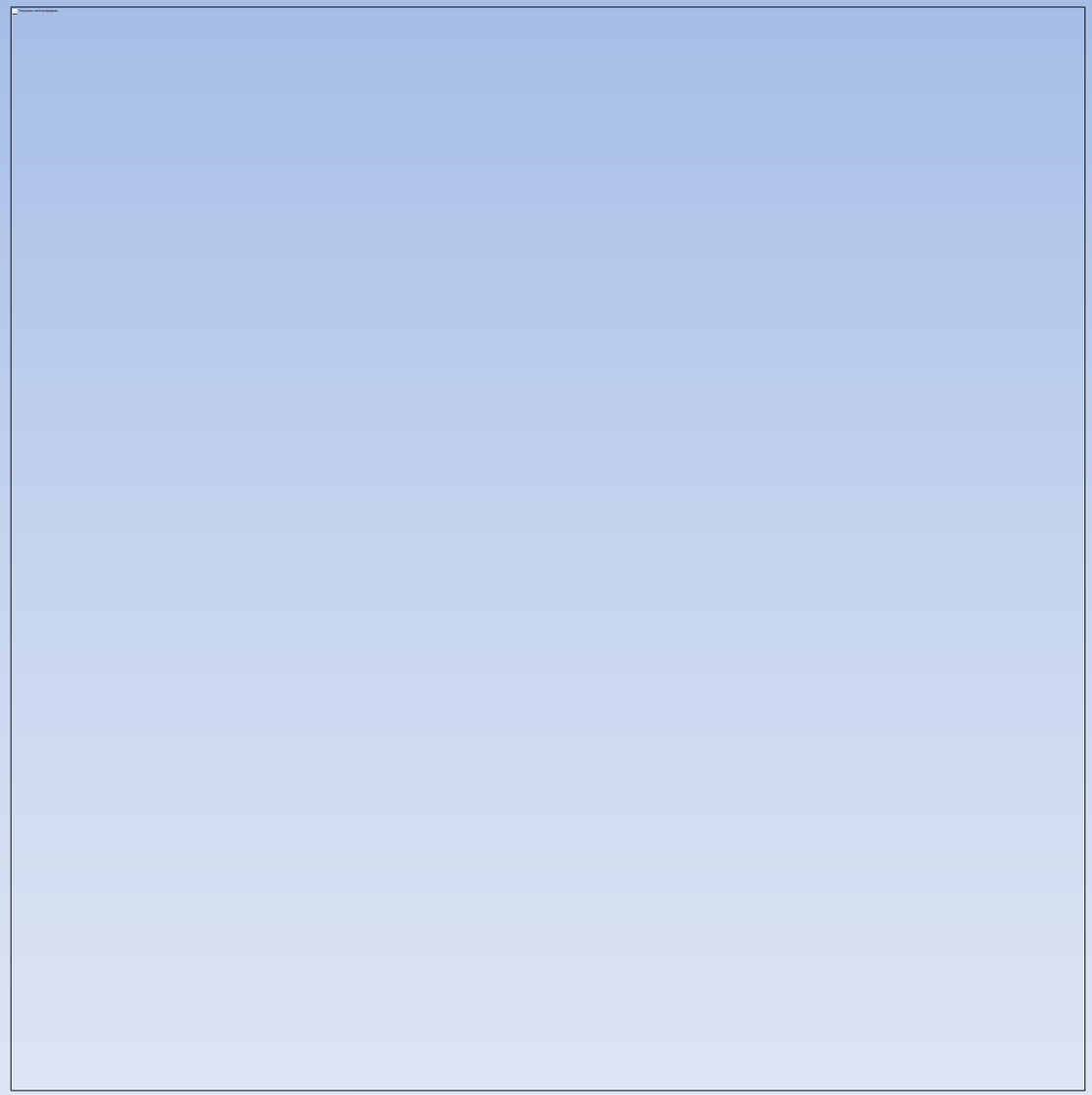
High Growth Scenario - 2070 – **McQueen Branch Aquifer** (layer 11) Simulated Pot Map Contours and Production Wells



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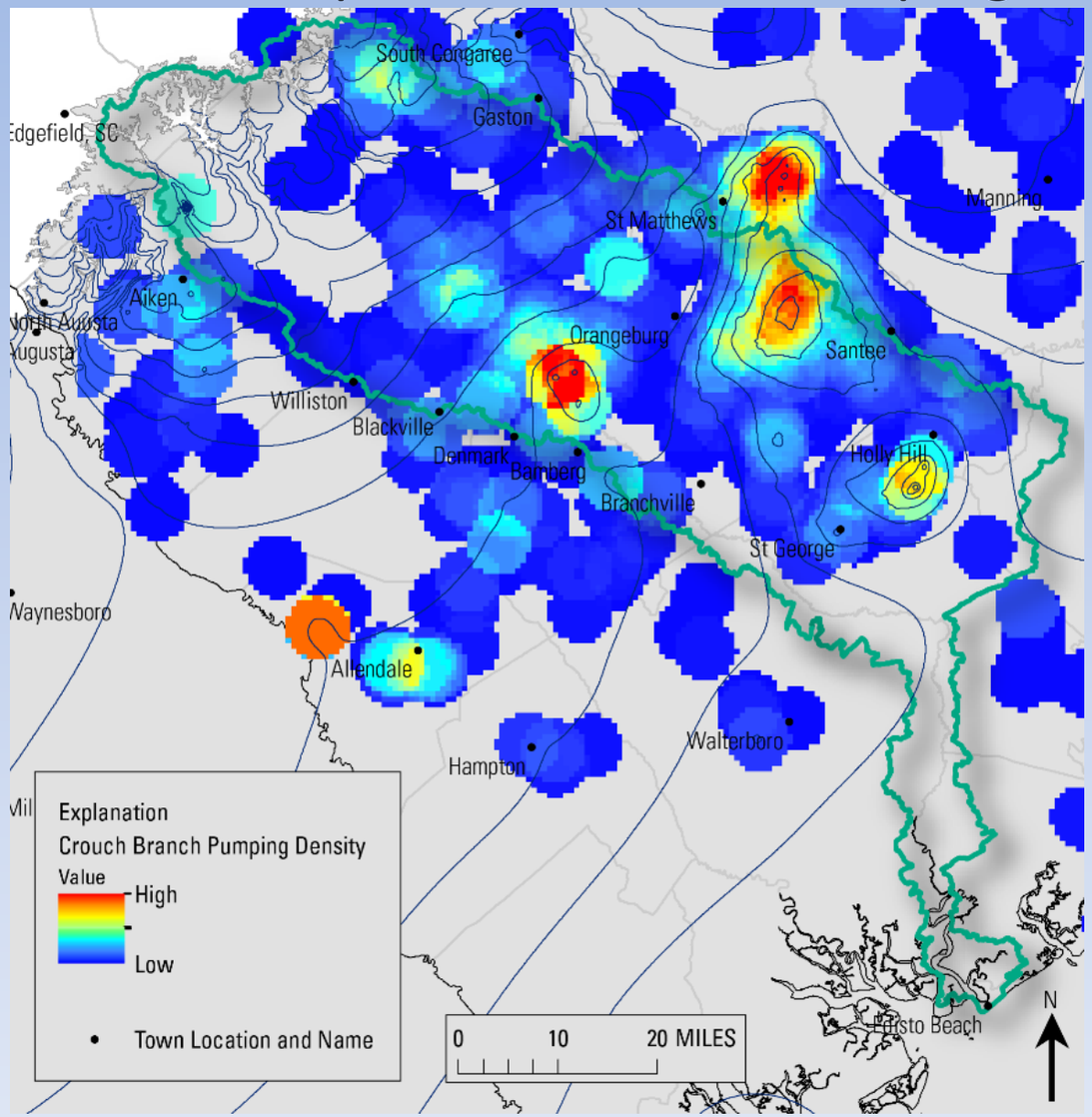
High Growth Scenario - 2070 – Crouch Branch Aquifer (layer 9) Simulated Pot Map Contours and Pumping Density



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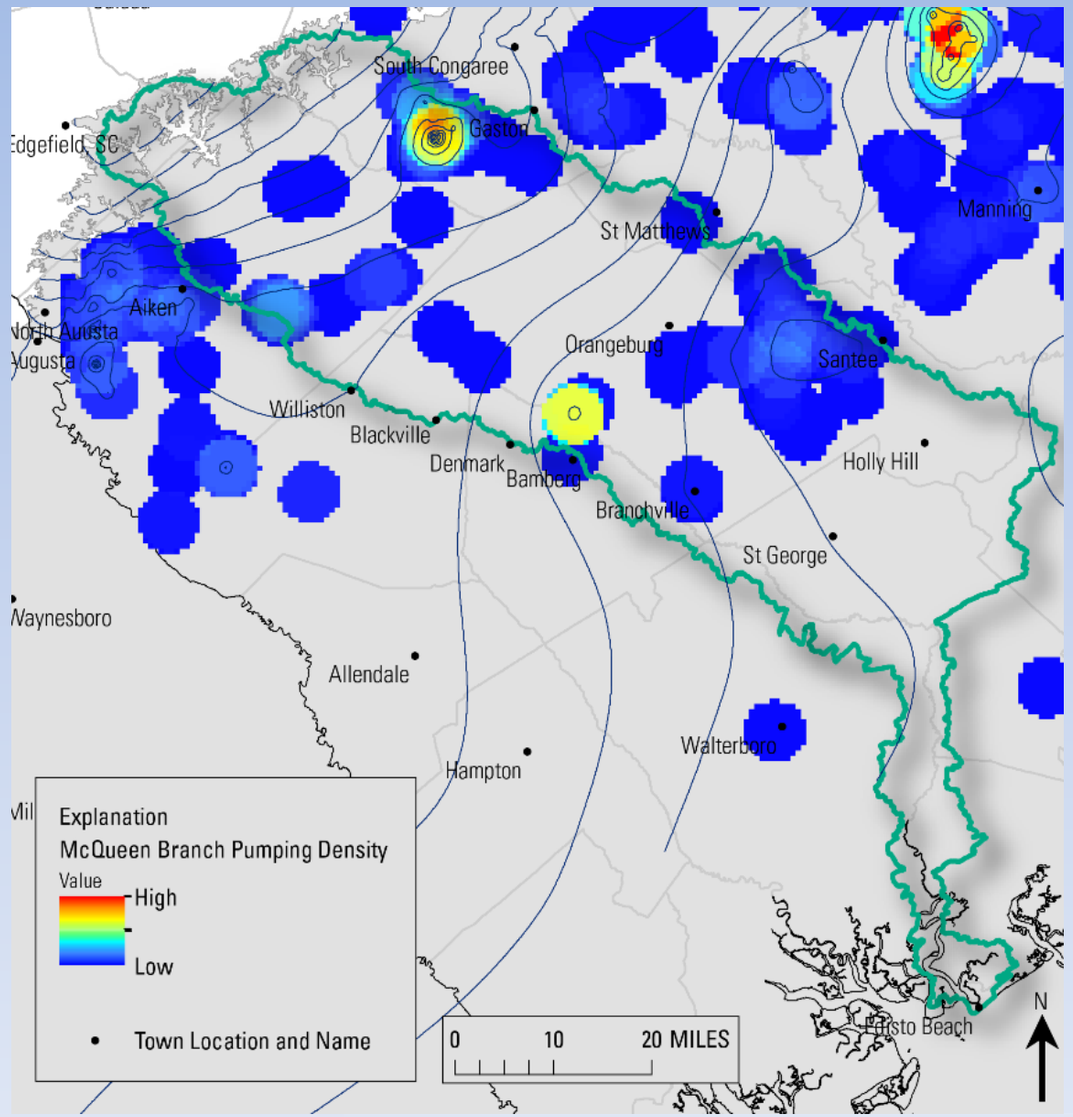

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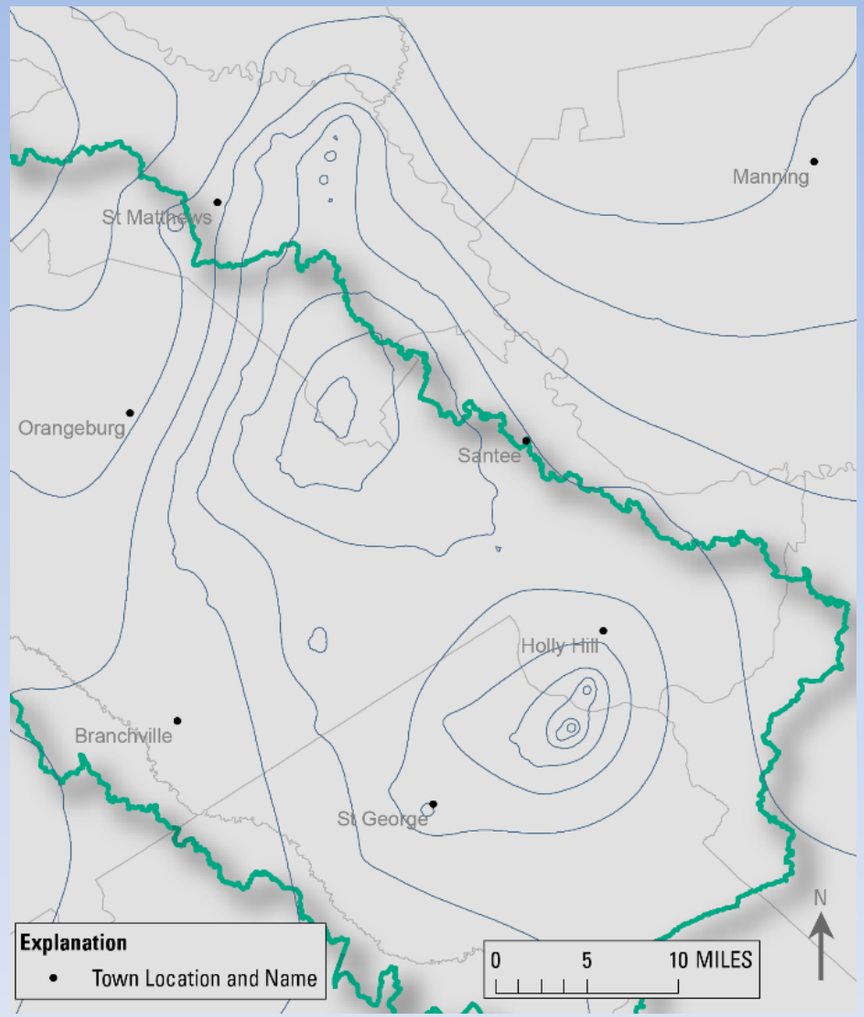
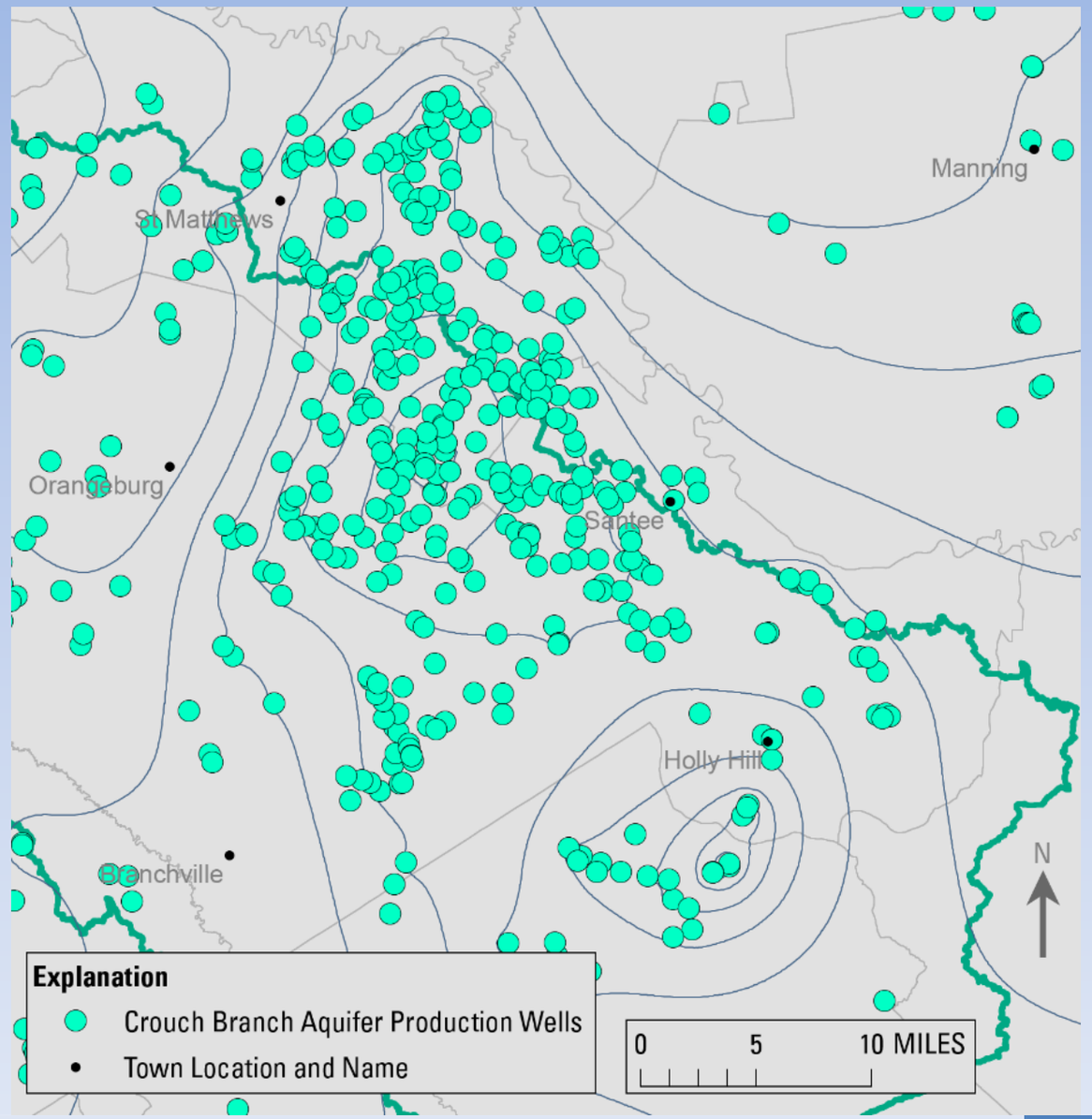
High Growth Scenario - 2070 – **Crouch Branch Aquifer** (layer 9)
Possible Areas of Concern





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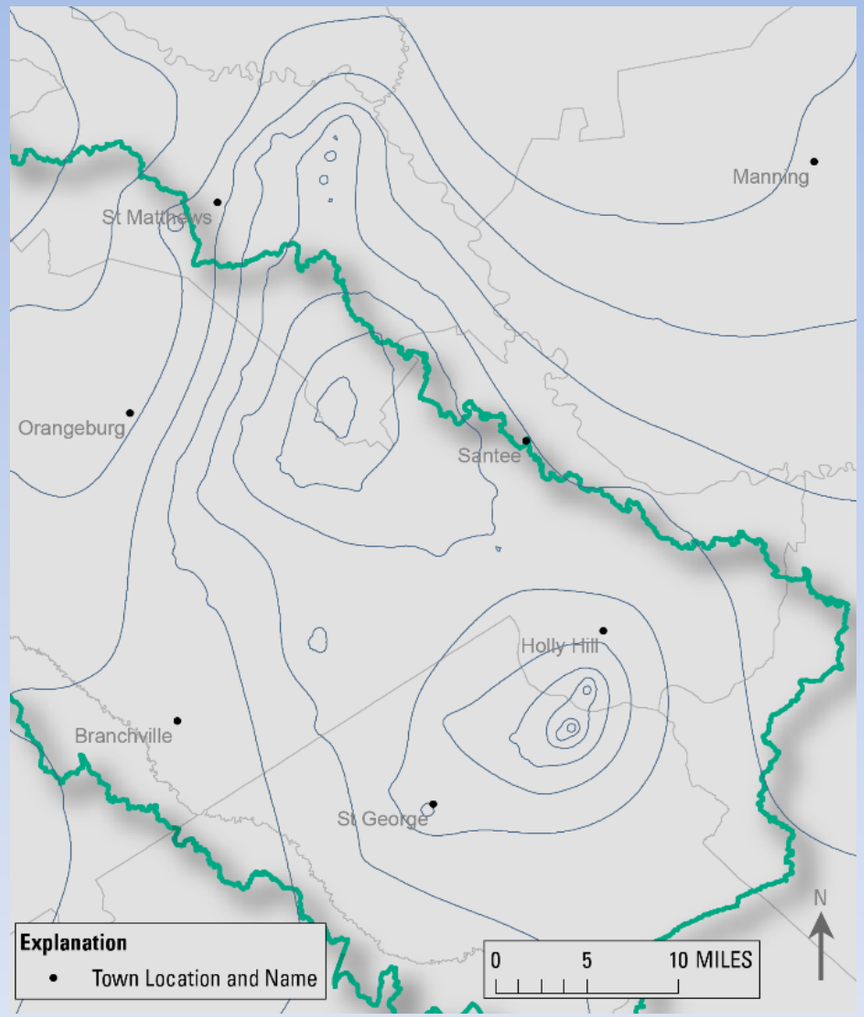

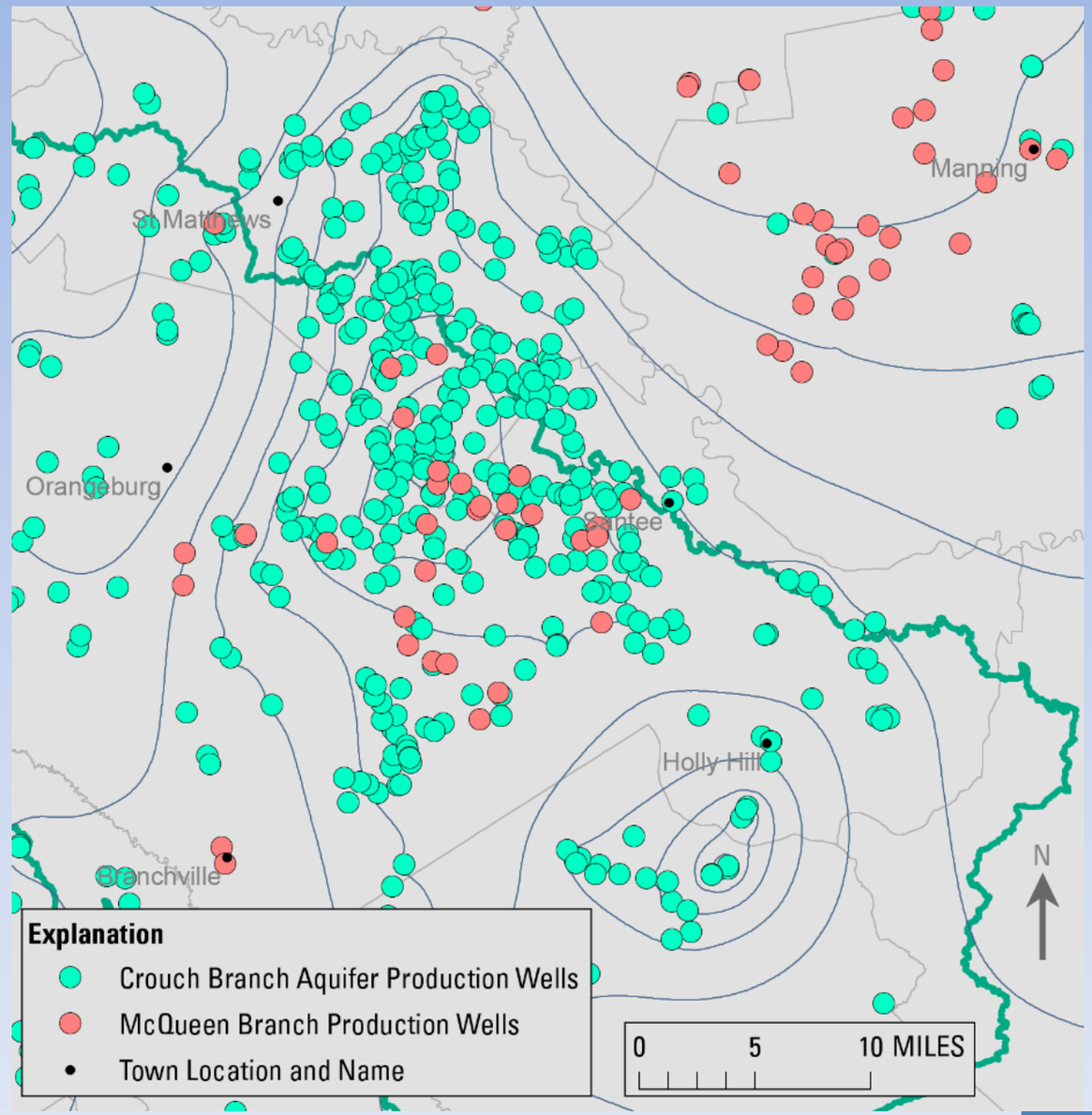

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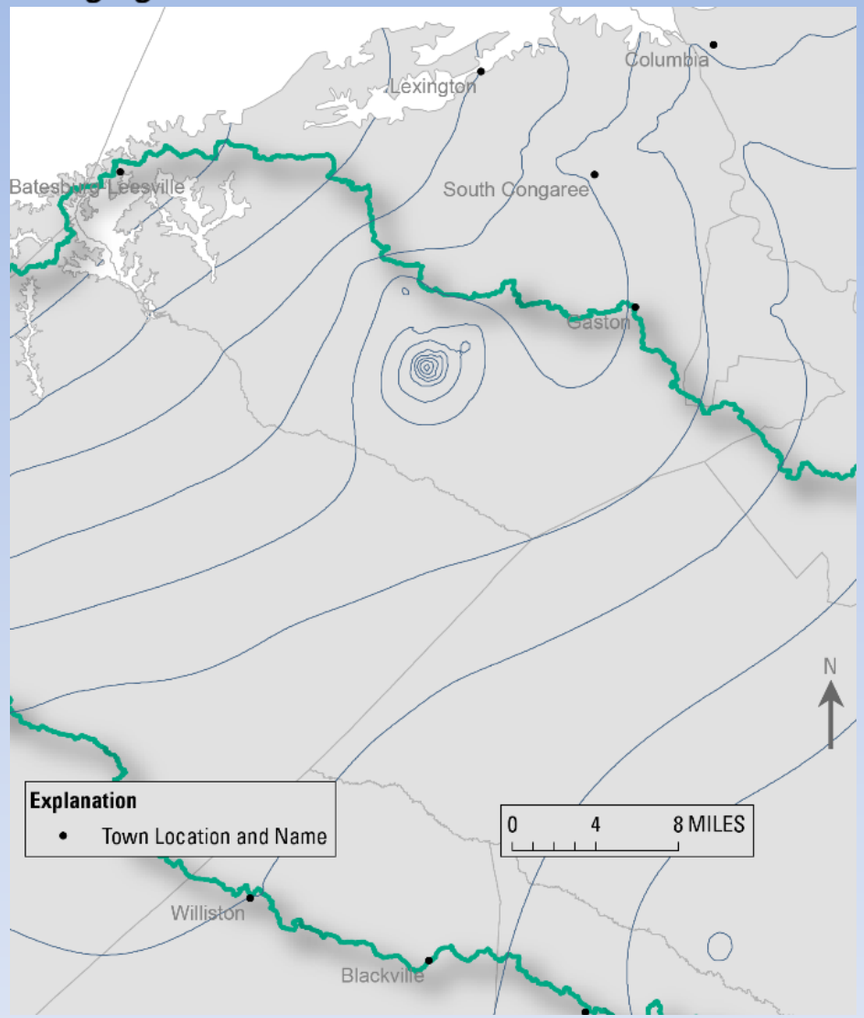

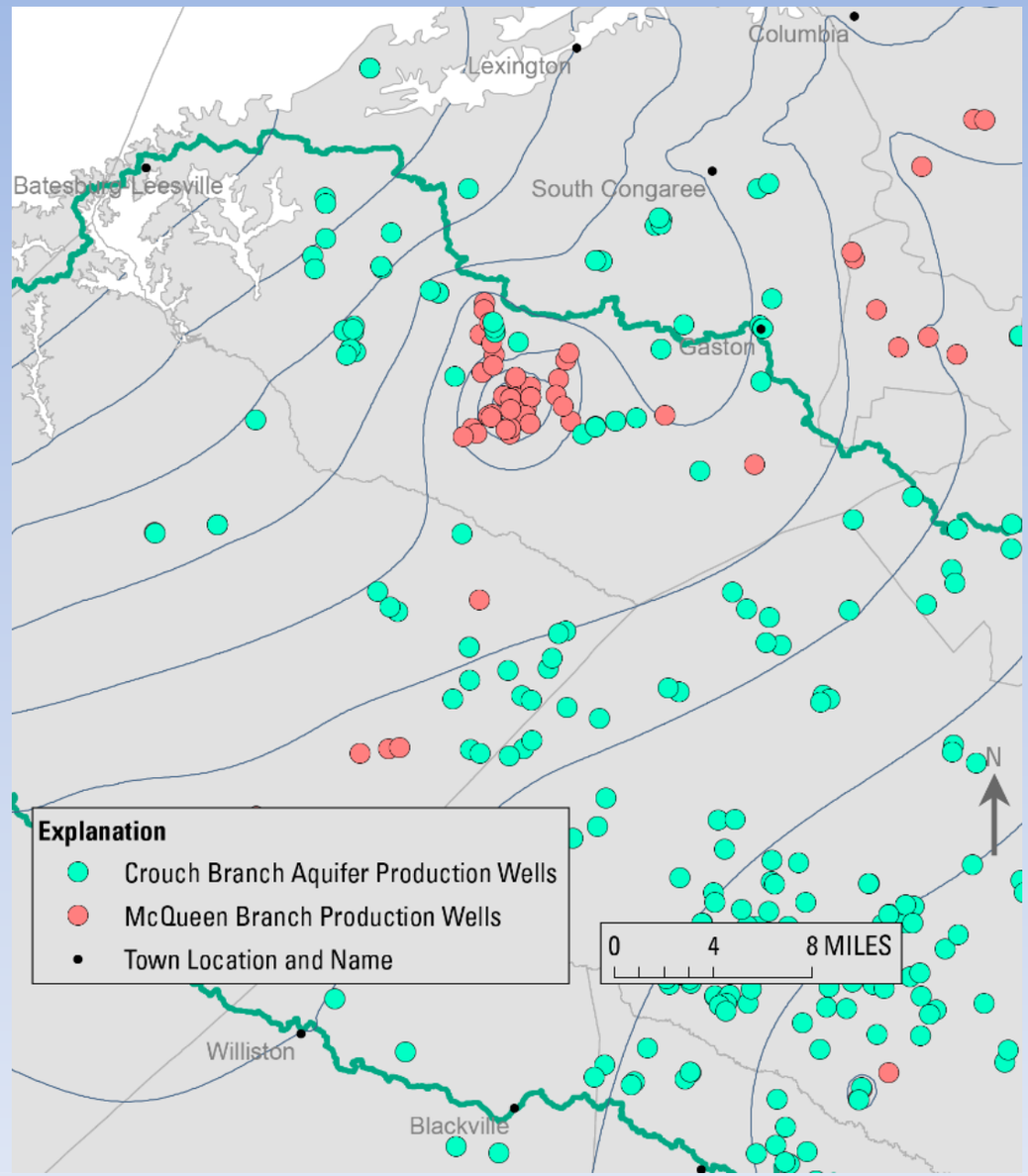

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Do we want to use the groundwater model to evaluate the impacts of any water management strategies?

Examples:

1. What is the impact of agricultural water conservation and efficiency strategies?

   For surface water users, we assumed 70% of existing ag surface water users implemented water efficiency strategies resulting in a 15% reduction in their demand.

2. What is the impact of transitioning a portion of the pumping from the Crouch Branch aquifer to the (deeper) McQueen Branch aquifer in Calhoun County?

3. What is the impact of transitioning a portion of the pumping from the McQueen Branch aquifer to the (shallower) Crouch Branch aquifer in Lexington County?

RBC Discussion and Decision Points

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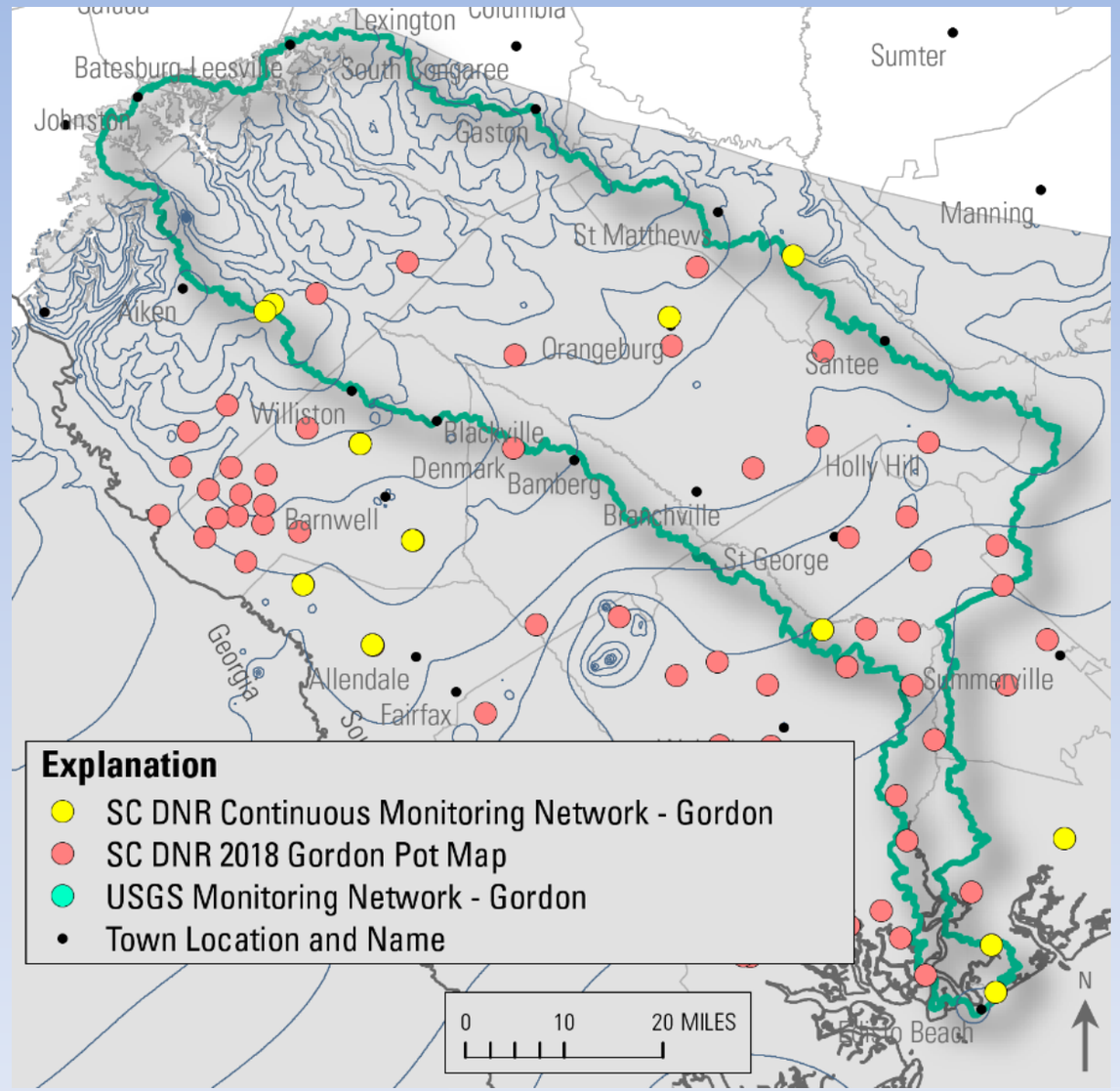
High Growth Scenario - 2070 - **Gordon Aquifer** (layer 7)
Simulated Pot Map Contours and Available Observation Wells



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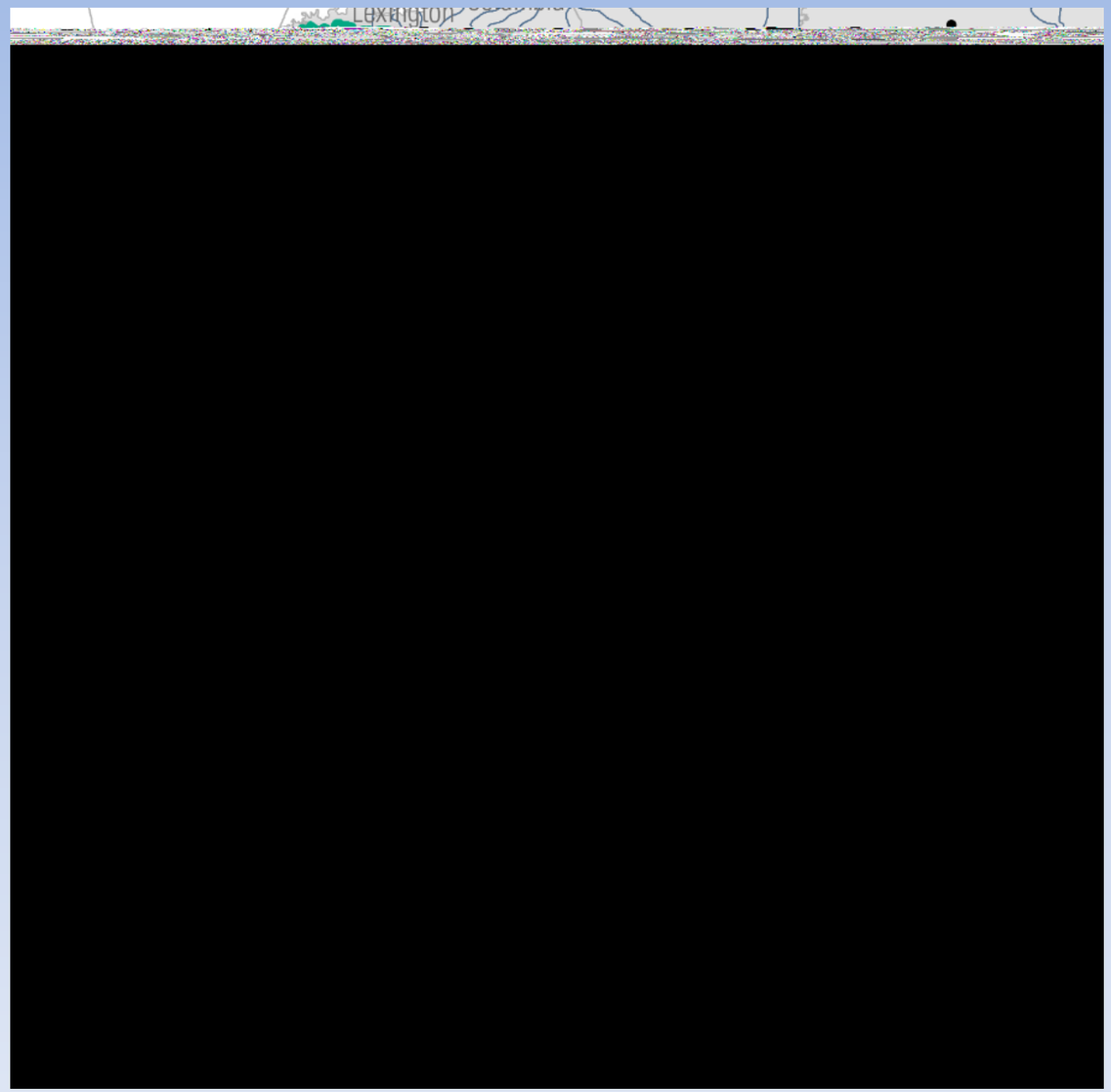

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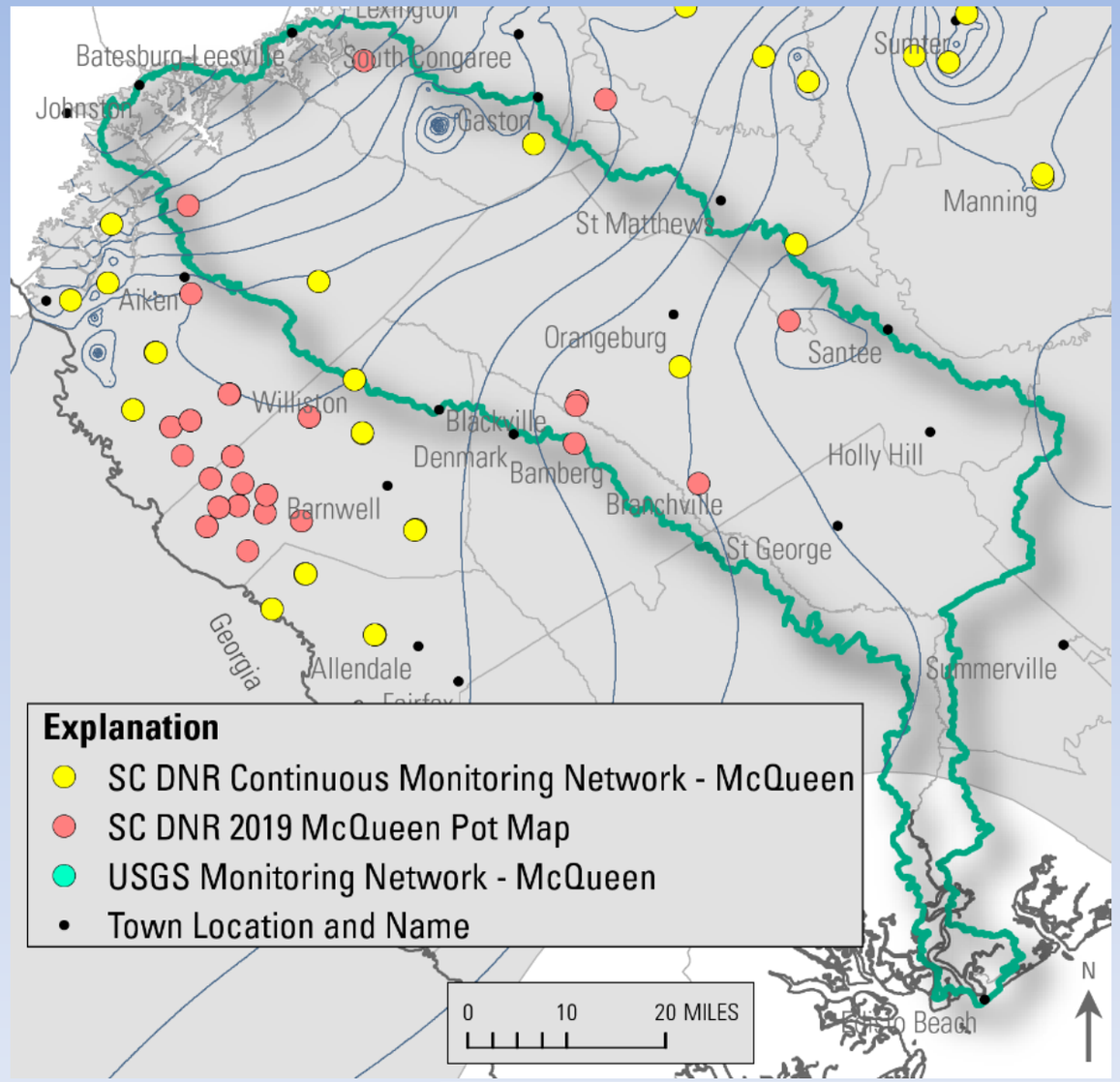

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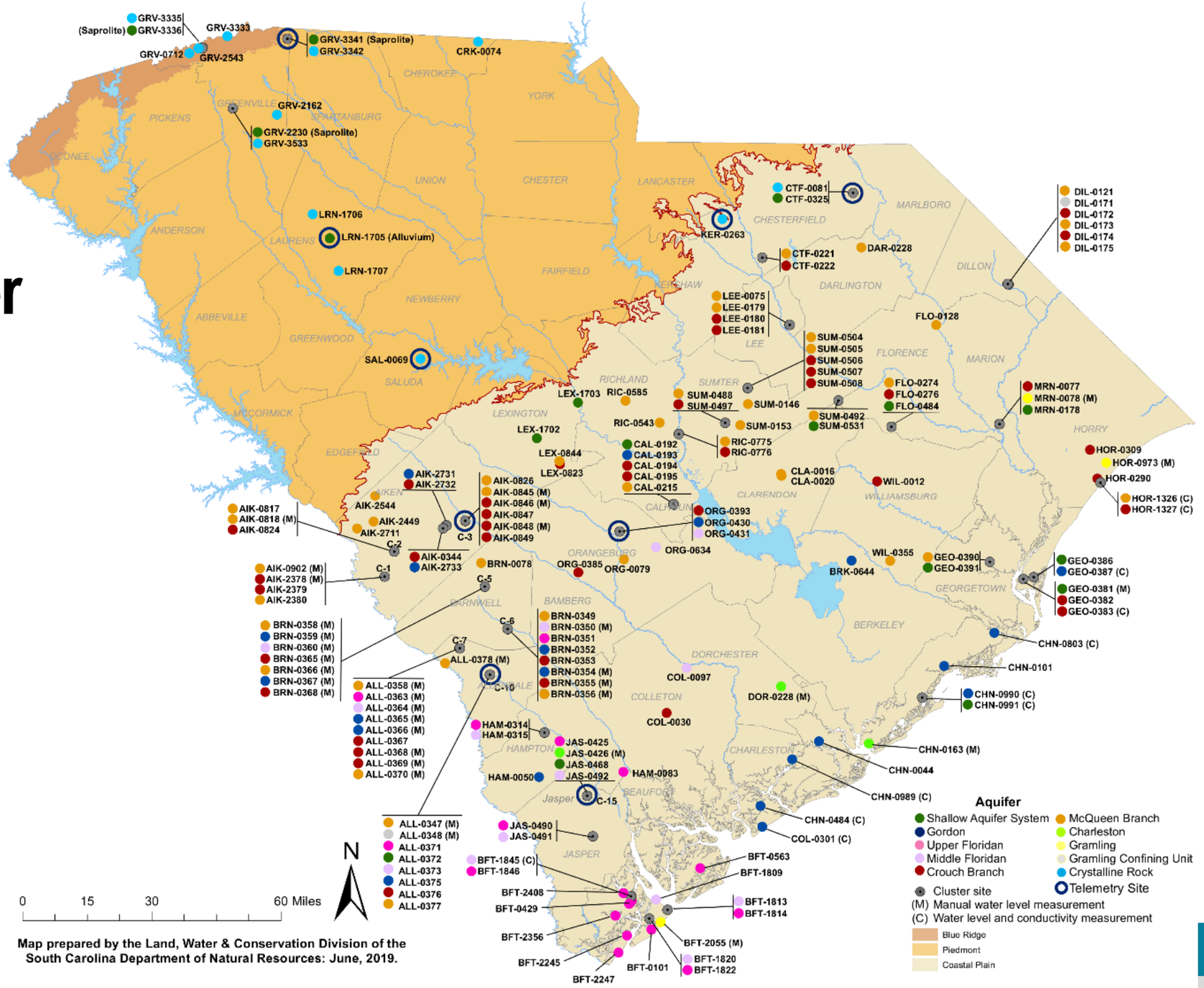
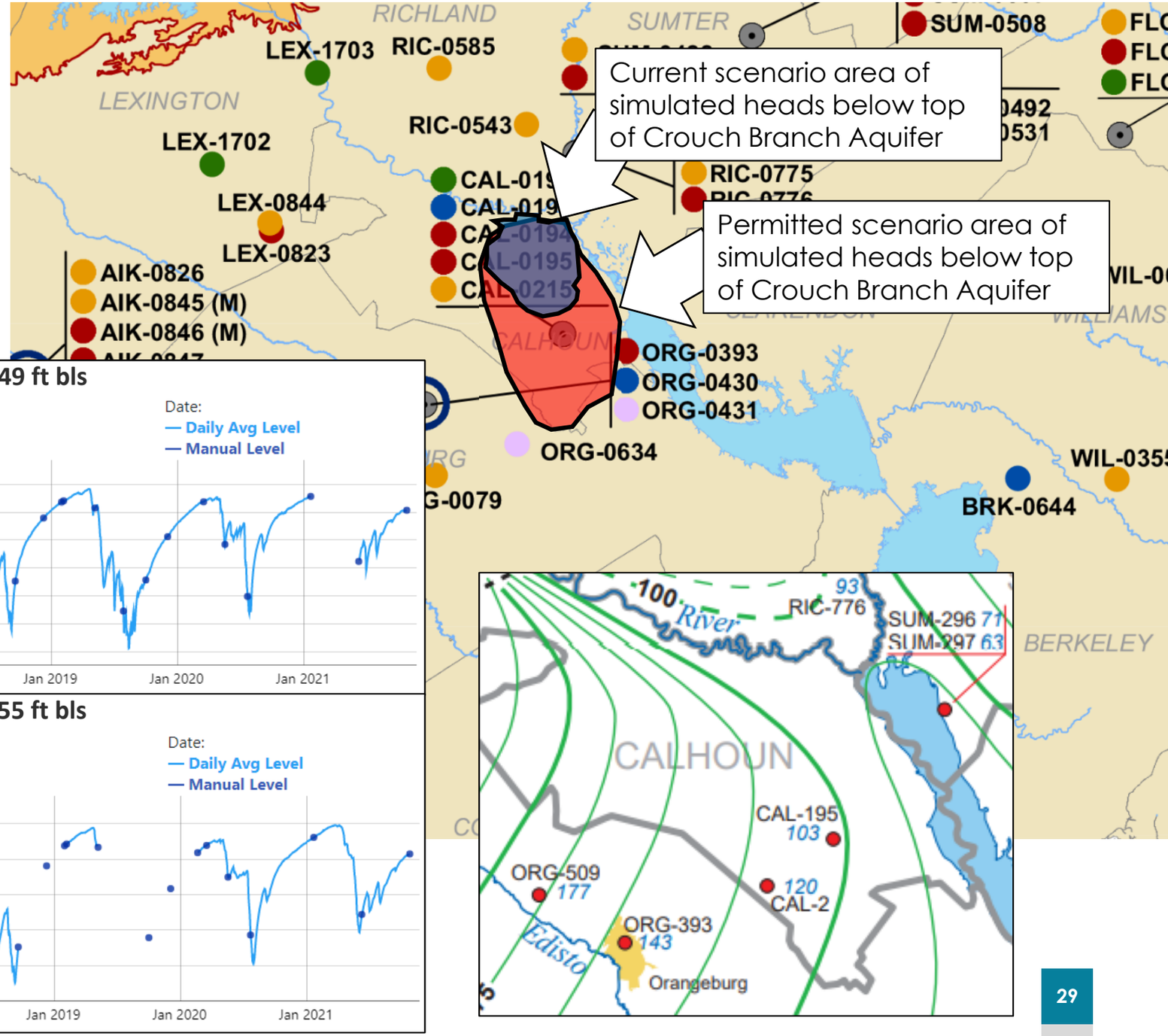
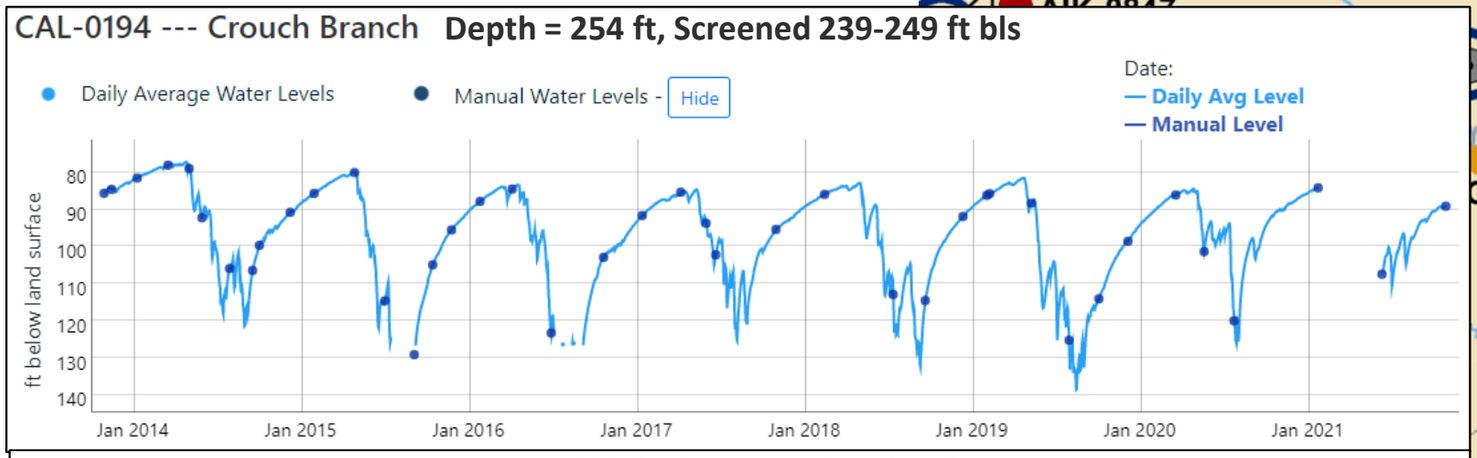
SCDNR Groundwater Monitoring Network

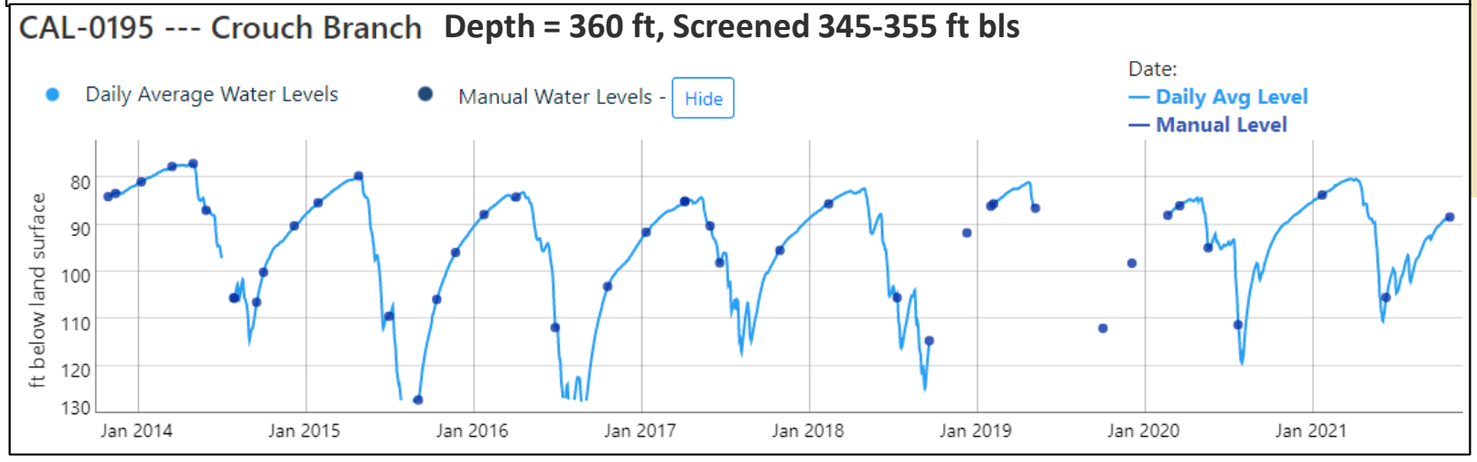


CAL-194 and CAL-195

Top of Crouch Branch Aquifer is ~180 feet bls at CAL-0194 and CAL-0195







Potential Technical Plan Recommendations to Consider

- Recommend SCDNR work with SCDHEC, USGS and other potential partners (e.g. property owners, well owners, Capacity Use Areas) to enhance monitoring capabilities especially in areas ~~in the Crouch Branch of Calhoun County and McQueen Branch of Lexington County~~ where model simulations indicate the potential for water levels to drop below the top of the aquifer.
- Recommend SCDNR work with SCDHEC and the USGS to develop a regional groundwater model covering the potential groundwater areas of concern and
  - Further calibrate the model to local conditions, include seasonal drawdowns
  - Evaluate seasonal drawdowns through 2070 using the planning scenarios

RBC Discussion and Decision Points

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2. **Discuss Monitoring in Groundwater Areas of Concern**

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3. **Discuss Possible Groundwater Conditions**

   Objective: Review and discuss if any groundwater conditions should be established as part of the Plan.

Groundwater Condition

- **Definition:** A limitation on the amount of groundwater that can be withdrawn from an aquifer, and which can be applied to evaluate **Groundwater Supply** for planning purposes.
- Examples:
  - Maintaining groundwater levels at or above a fixed elevation over a planning period
  - Preserving a certain volume of groundwater in storage
  - Maintaining water levels in the Gordon, Crouch Branch and McQueen Branch aquifers above the top of each aquifer (or a certain distance above the top of each aquifer to maintain a buffer)

Metrics used in Georgia to determine Sustainable Yield of Aquifers

- Drawdowns of groundwater levels in the pumped aquifer do not exceed 30 feet between pumping wells;
- Recharge from surface water sources were constrained to 40 percent of baseflow in order to maintain opportunities for surface water use;
- Reduction in aquifer storage does not go beyond a new base level;
- Groundwater levels are not lowered below the top of a confined aquifer; and
- The ability of the aquifer to recover to baseline groundwater levels between periods of higher pumping during droughts is not exceeded

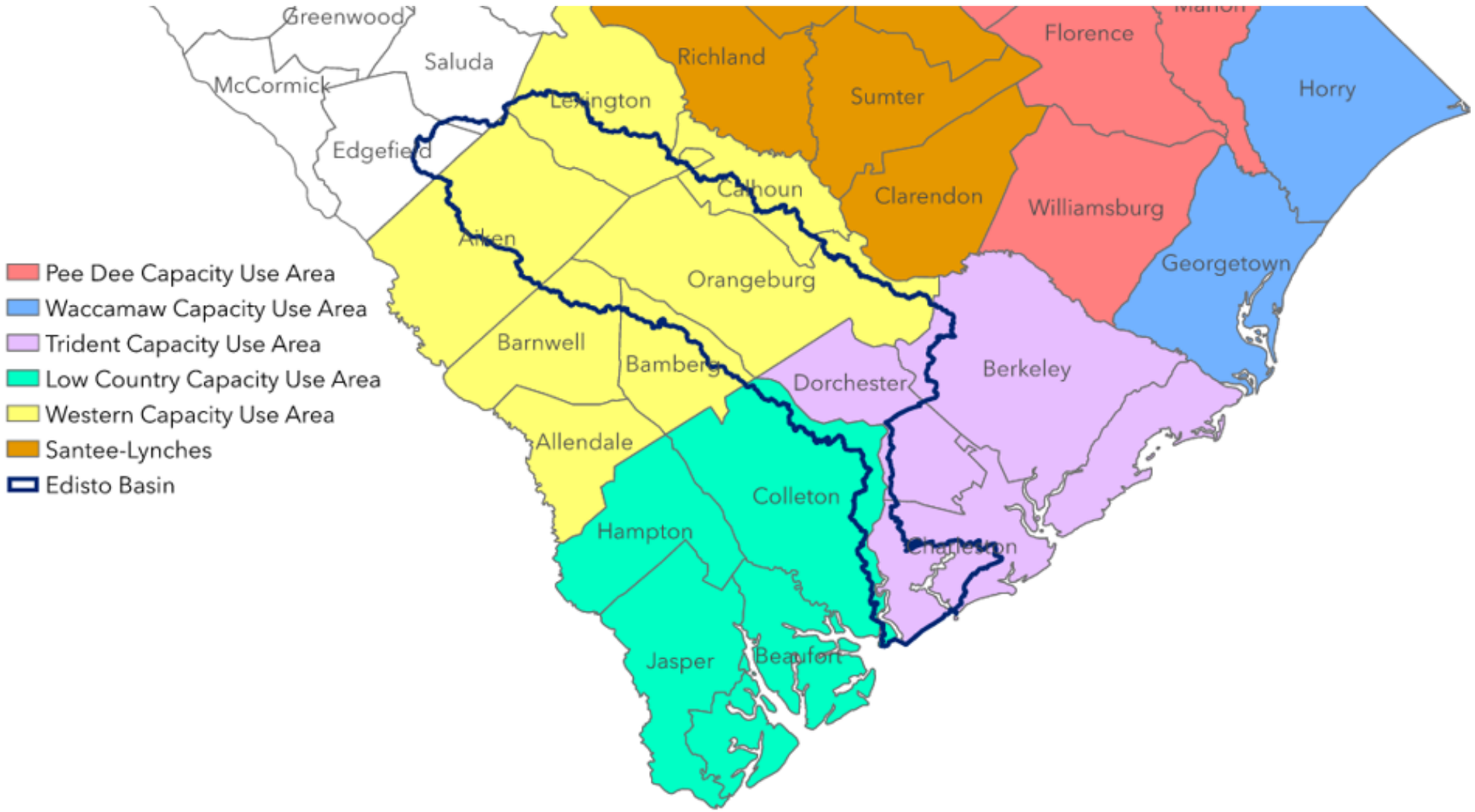
These metrics were used to identify a **range of sustainable yield** in major aquifers (i.e., they were used to identify **available supply**)

In Texas, Planners Identified "Desired Future Conditions", Such As:

- Limiting drawdowns in the Ogallala aquifer to an average of 20 feet in Randall County for the period 2012-2062.
- Causing no more than 30 feet of average declines in the Dockum aquifer in Carson County for the period 2012-2062.
- Retaining at least 50% of the remaining storage in the Ogallala and Rita Blanca aquifers in Hansford County for the period 2012-2062.

Once the **Desired Future Condition** was determined for each aquifer, the State, using groundwater models, determined the amount of groundwater that can be pumped that will achieve the **Desired Future Condition**. This was called the **"Modeled Available Groundwater"**.

Groundwater Management Areas



Western Groundwater Management Area Strategies

1. Establish a comprehensive GW monitoring program
2. Identify geographic areas of concern and level/reduce pumping where appropriate
3. Review permit applications based on demonstrated reasonable use
4. Establish a conservation education plan for the general public and existing GW withdrawers
5. Manage through regulation and planning
6. Establish a plan for continual stakeholder engagement and awareness of groundwater development

2. Identify geographic areas of concern and level/reduce pumping where appropriate

Measures that SC DHEC may require applicants, permit holders, and groundwater withdrawers to take may include, but not be limited to, the following:

1. Reduce/level groundwater withdrawals in areas of concentrated pumping.
2. Reduce/level groundwater withdrawals in areas where it is found to be in the public interest or general welfare, or to protect the water resource.
3. Utilize other available freshwater aquifers than those currently used.
4. Utilize conjunctive use of aquifers, or waters of less desirable quality, where water quality of a specific character is not essential.

2. Identify geographic areas of concern and level/reduce pumping where appropriate

5. Utilize the groundwater model of the coastal aquifers that has been developed by the USGS and SC DNR to determine the potential for adverse effects.

6. Implement construction and use of observation or monitoring wells.

7. Implement reasonable and practical methods to conserve and protect the water resources and to avoid or minimize adverse effects of the quantity and quality of water available to persons whose water supply has been materially reduced or impaired as a result of groundwater withdrawals.

8. Implement such other necessary and appropriate control or abatement techniques as are technically feasible.

Does the RBC want to set a Groundwater Condition?

- Examples:
  - Maintaining groundwater levels at or above a fixed elevation over a planning period
  - Preserving a certain volume of groundwater in storage
  - Maintaining water levels in the Gordon, Crouch Branch and McQueen Branch aquifers above the top of each aquifer (or a certain distance above the top of each aquifer to maintain a buffer)