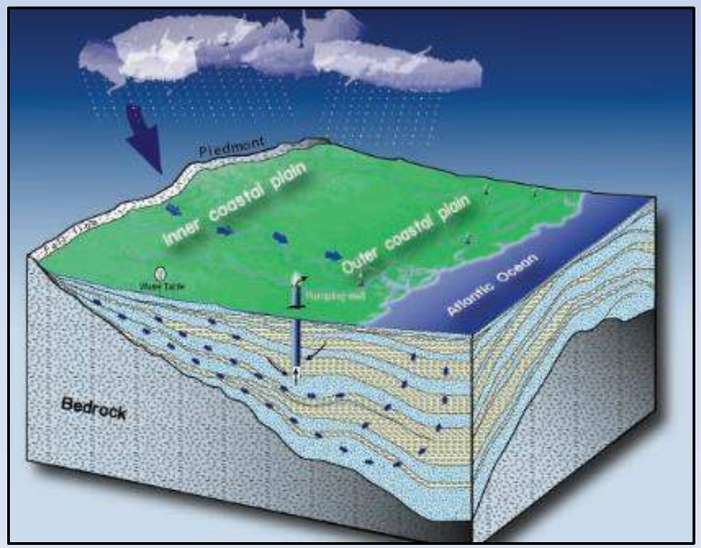
Simulation of Groundwater Flow in the Edisto River Basin, South Carolina

Greg Cherry, Matt Petkewich, and Andrea Hughes

US Geological Survey – South Atlantic Water Science Center



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Overview of Scenarios

Base Scenario	Modifications
High Growth	Relocate Future Pumping Demand and Reduce Irrigation Pumping by 15%: Projected increases in water use for the Crouch Branch aquifer wells in Calhoun County were moved to the McQueen Branch aquifer. In addition, a 15% reduction in irrigation pumping was applied.
Moderate Growth	Relocate Future Pumping Demand and Reduce Irrigation Pumping by 15%: Projected increases in water use for the Crouch Branch aquifer wells in Calhoun County were moved to the McQueen Branch aquifer. In addition, a 15% reduction in irrigation pumping was applied.

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Overview of Simulation Results

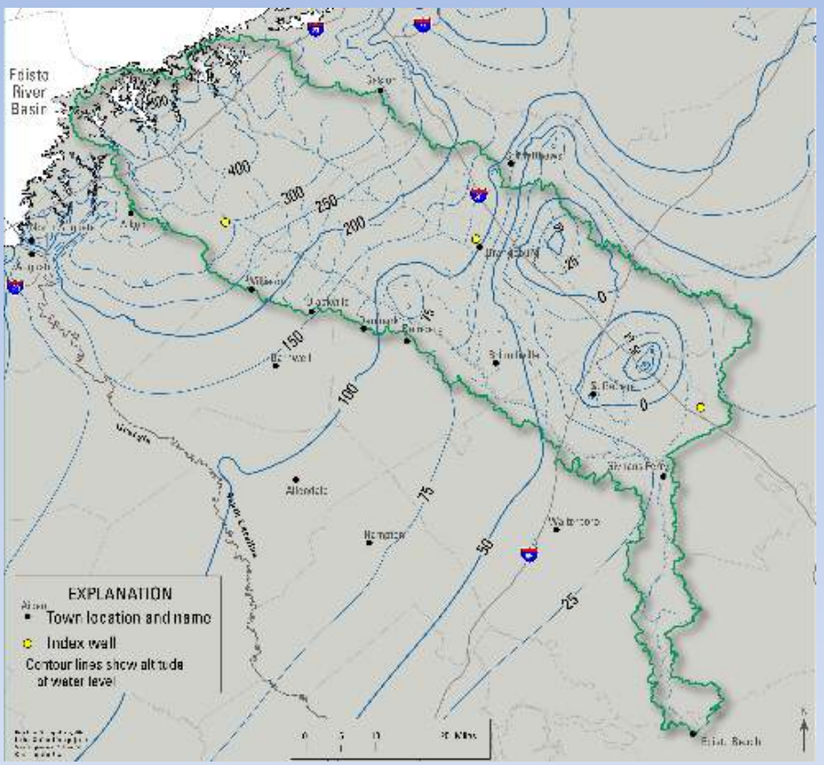
Potentiometric Maps • Breach of Aquifer Maps • Hydrographs of Index Wells

Potentiometric Maps: Gordon aquifer maps were excluded because they are largely unchanged. New scenario results are presented side-by-side with the base scenario from which they were produced.

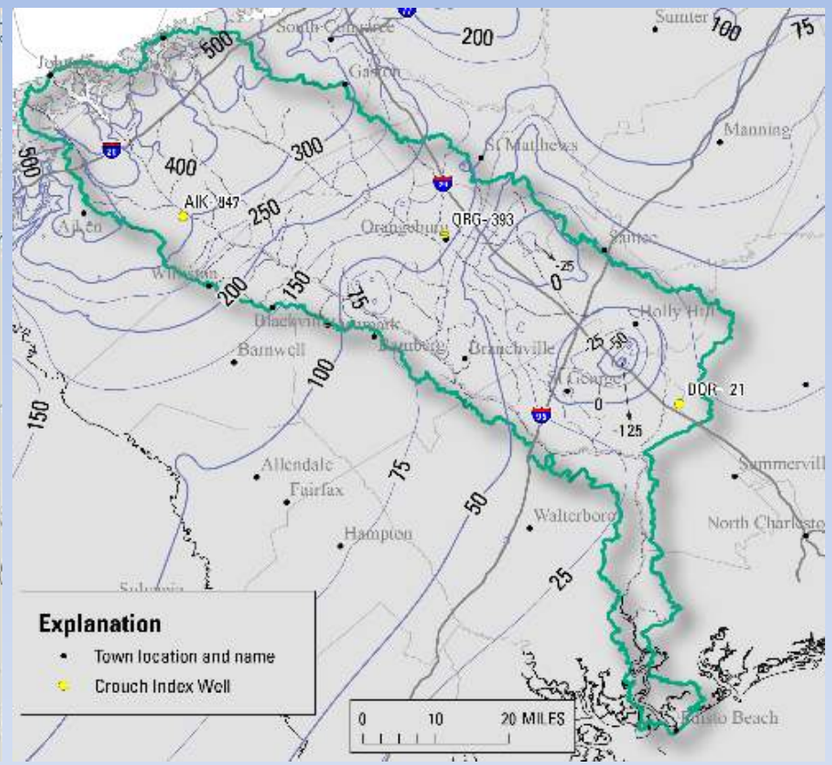
Breach of Aquifer Maps: Breach of aquifer maps from the newest scenario results are compared side-by-side with the current groundwater use scenario and the base scenario from which the newest scenario results were produced.

Hydrographs: hydrographs for the new scenarios are presented for the Crouch Branch and McQueen Branch index wells (3 wells for each aquifer).

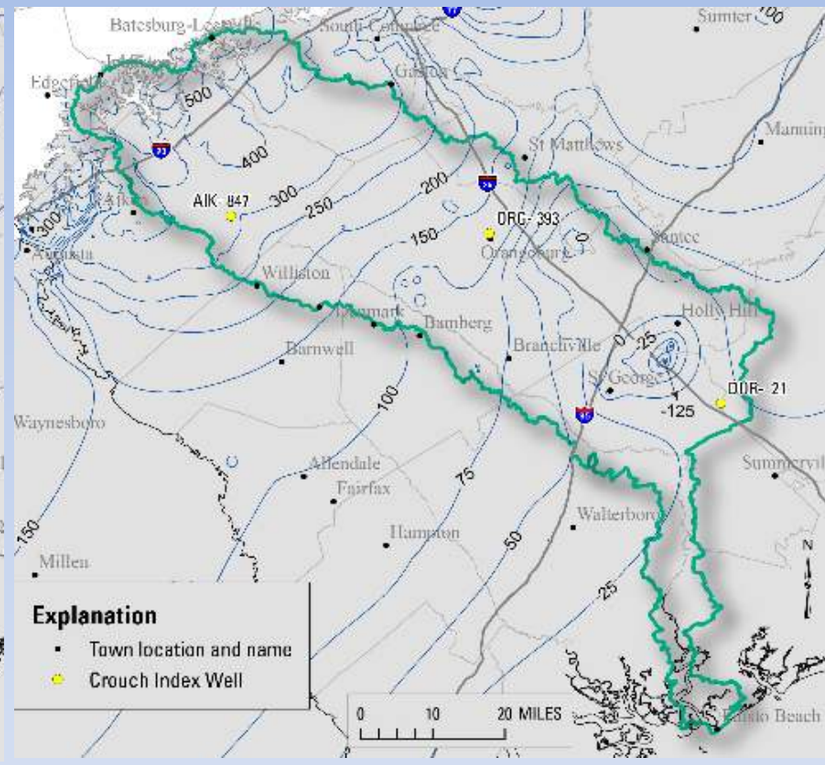
High Growth Scenario Comparison (2070)
Crouch Branch aquifer (layer 9)



High Growth (75 MGD)



Relocate New Pumping



Combined Scenario

Relocate Pumping and Reduce Irrigation

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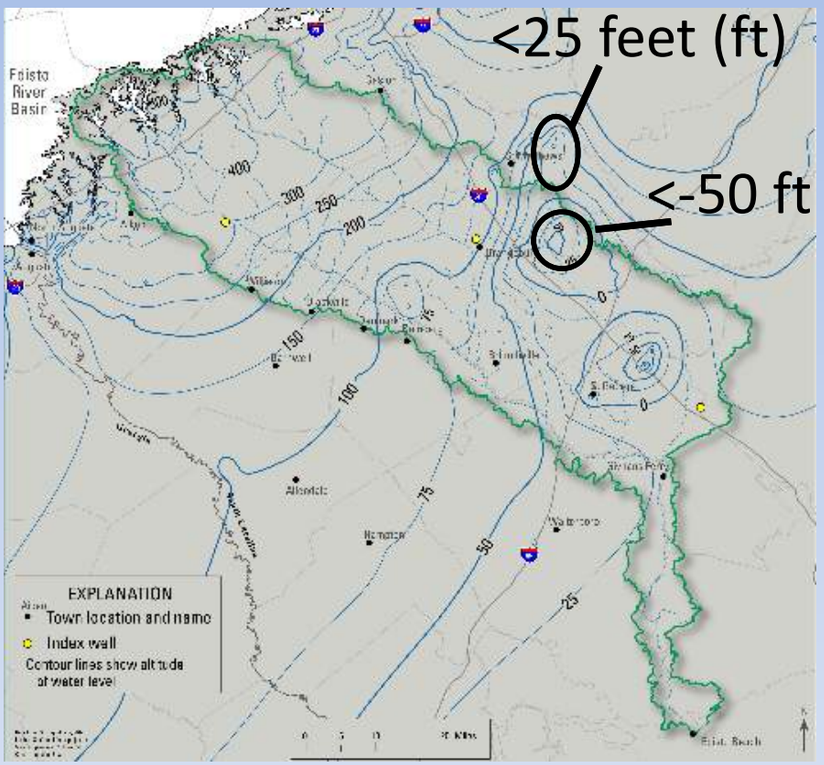
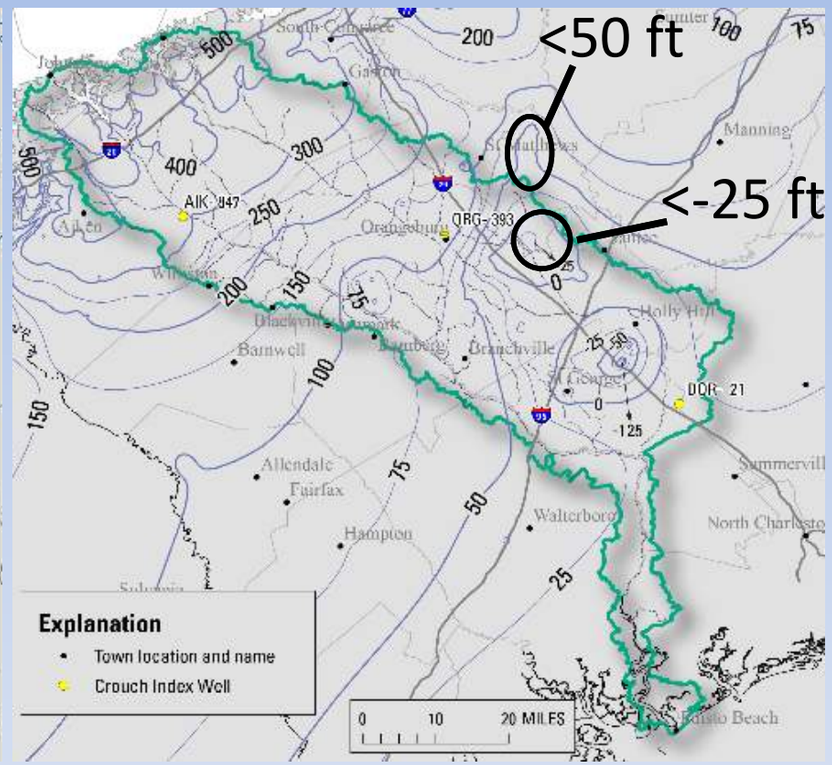
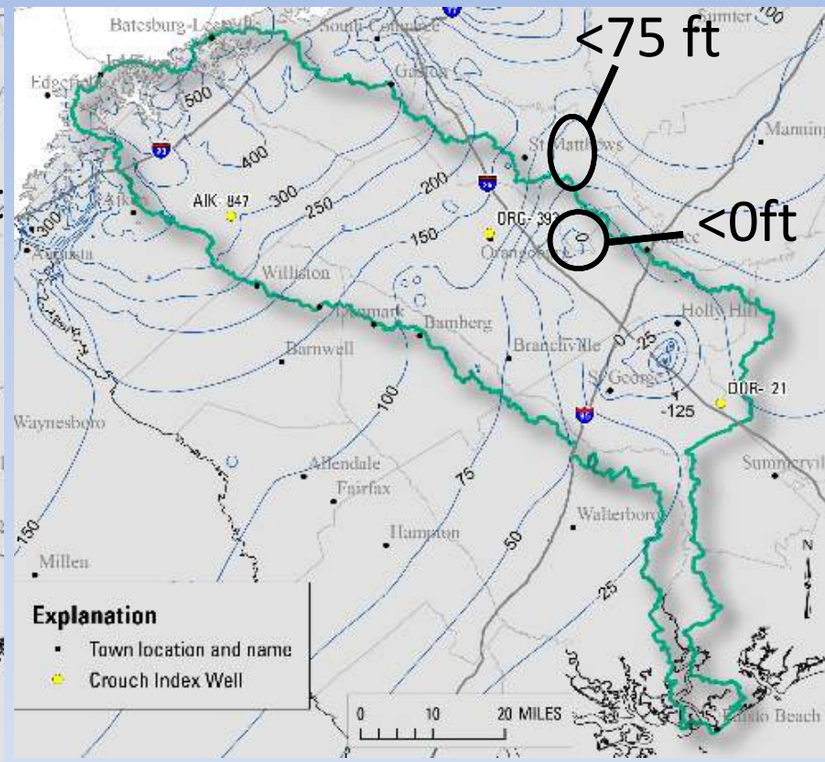
High Growth Scenario Comparison (2070)
Crouch Branch aquifer (layer 9)



High Growth (75 MGD)



Relocate New Pumping



Combined Scenario

Relocate Pumping and Reduce Irrigation

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High Growth Scenario Comparison (2070)
Crouch Branch aquifer (layer 9)

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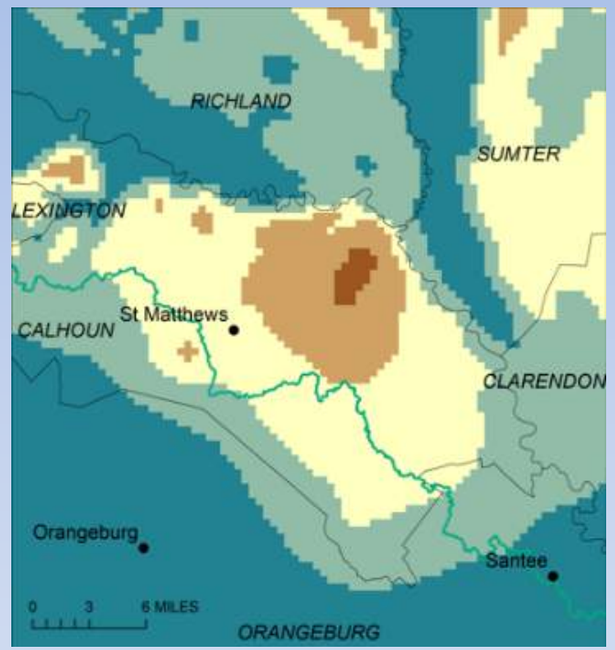
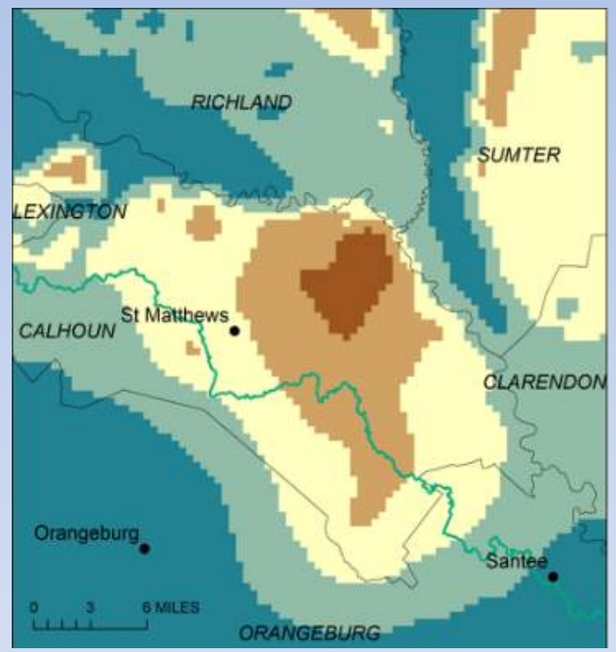
Current (52 MGD)



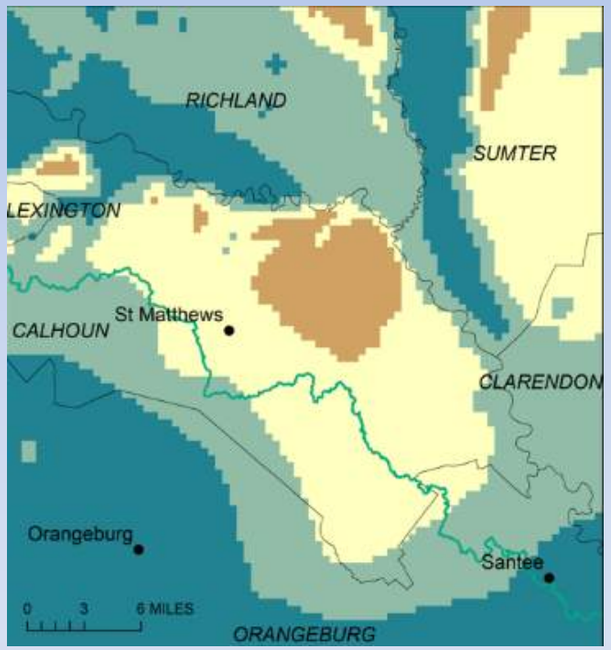
60 feet below top of aquifer

High Growth (75 MGD)



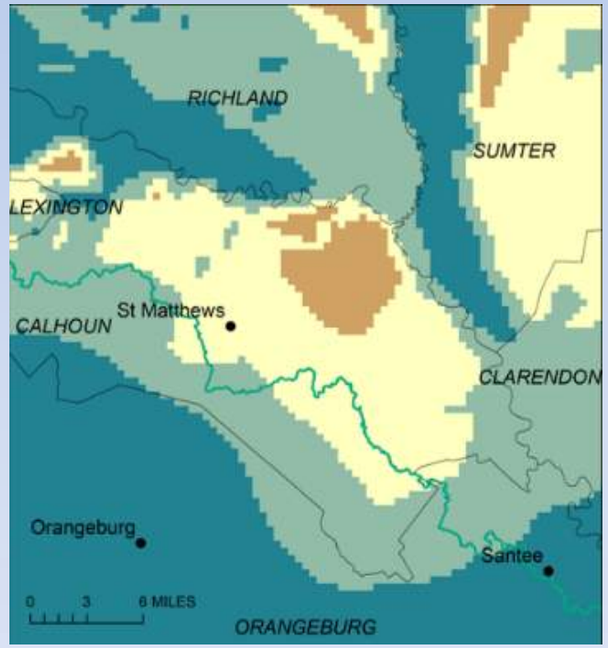
91 feet below top of aquifer

Relocate New Pumping



50 feet below top of aquifer

Combined Scenario: Relocate Pumping and Reduce Irrigation



32 feet below top of aquifer

Legend

- Town location and name
- Edisto Basin Outline

Simulated Head minus Top Elevation of Aquifer in feet (ft)

- Below -50
- -50 to 0
- 0 to 50
- 50 to 100
- Above 100

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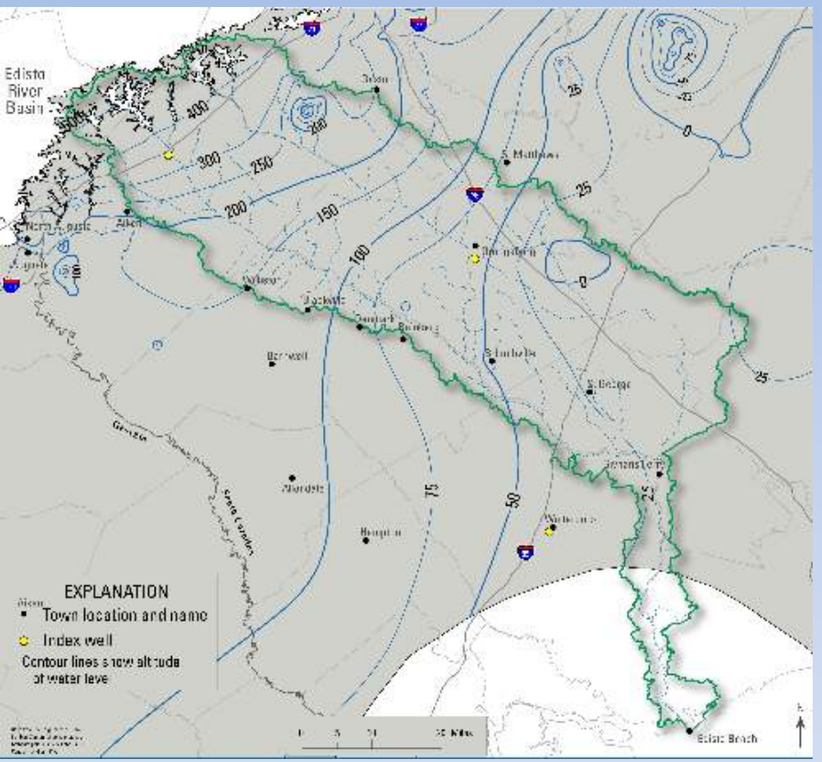
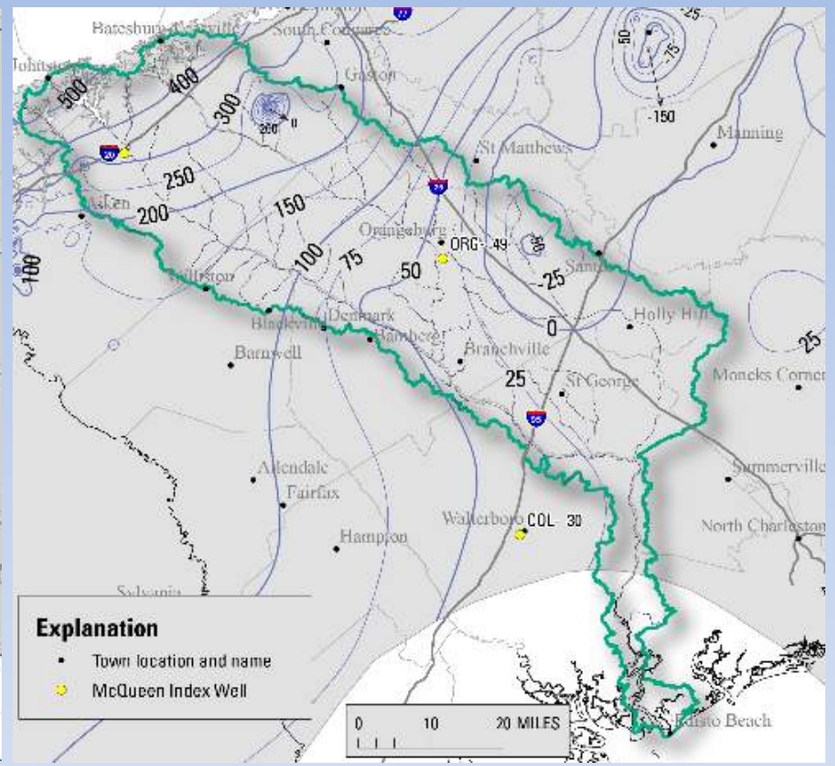
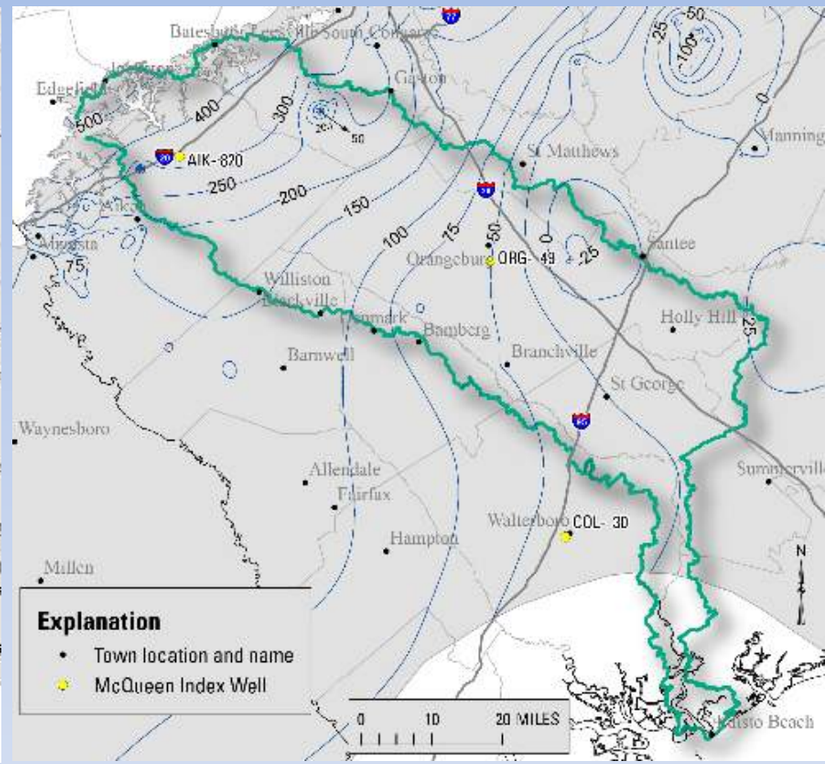
High Growth Scenario Comparison (2070)
McQueen Branch aquifer (layer 11)







High Growth (23 MGD)

Relocate New Pumping

Combined Scenario
Relocate Pumping and Reduce Irrigation

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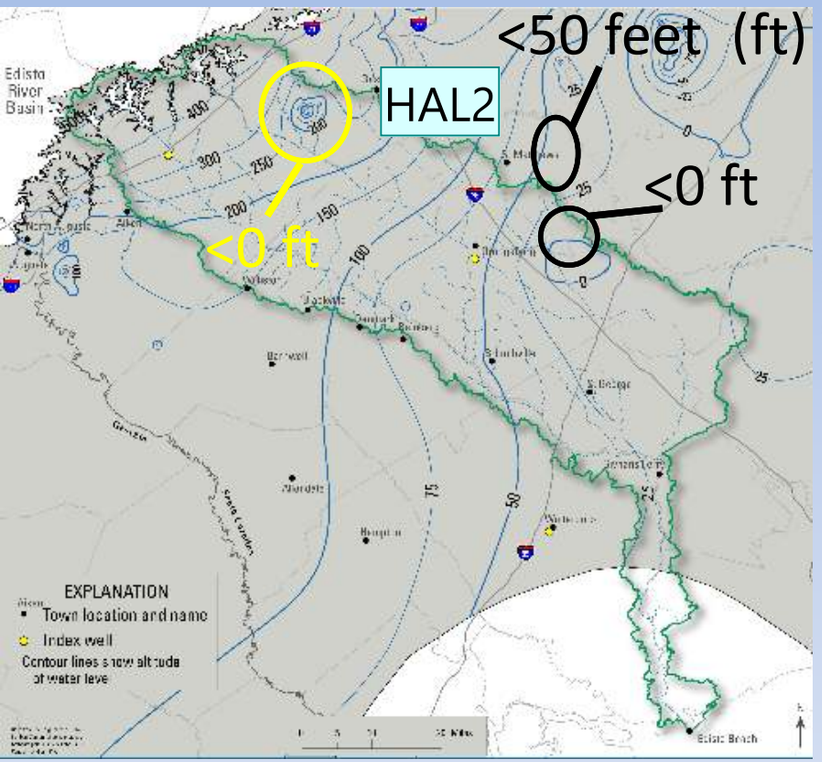
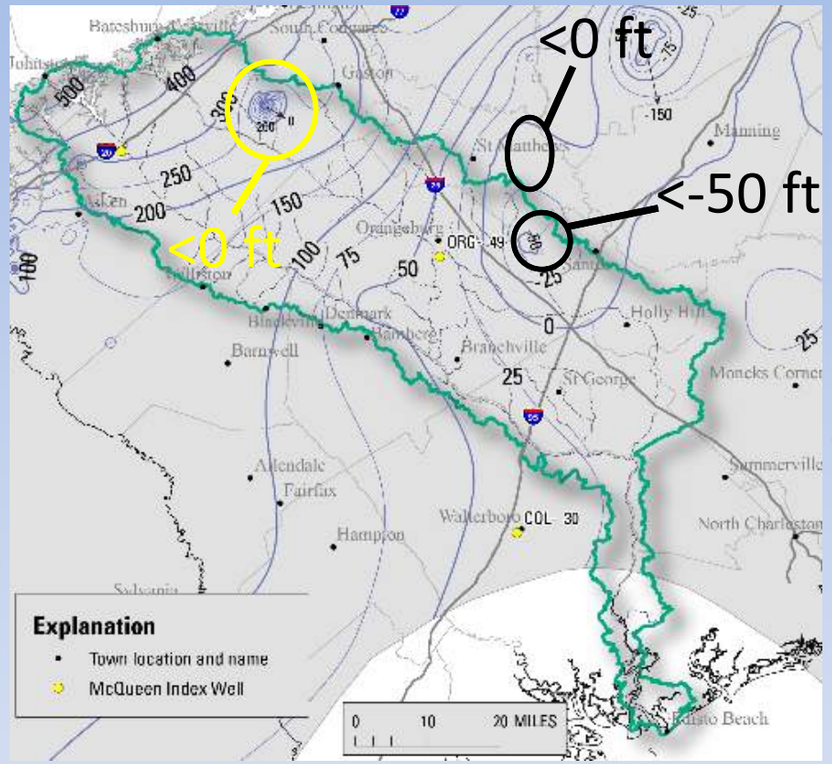
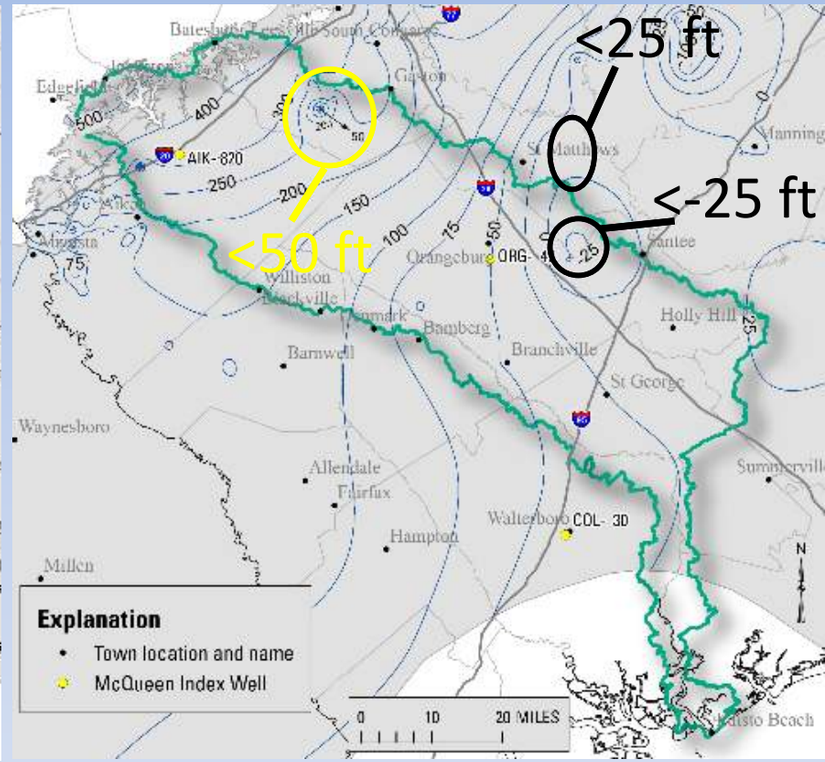
High Growth Scenario Comparison (2070)
McQueen Branch aquifer (layer 11)



High Growth (23 MGD)



Relocate New Pumping



Combined Scenario
Relocate Pumping and Reduce Irrigation

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Slide 8

HAL2 The Area of Concern for the McQueen Branch is the cone of depression near Gaston, so I think only one circle and callout per map showing the changes to that cone (if any) shoul
Hughes, Andrea L, 6/19/2022

High Growth Scenario Comparison (2070)
McQueen Branch aquifer (layer 11)

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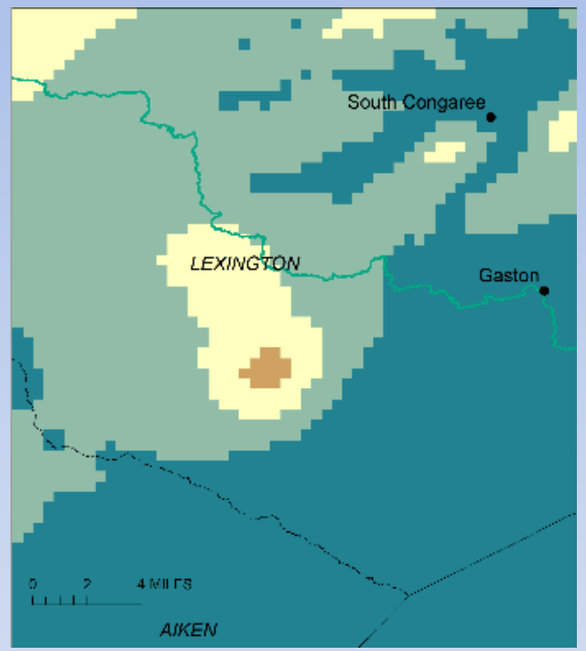
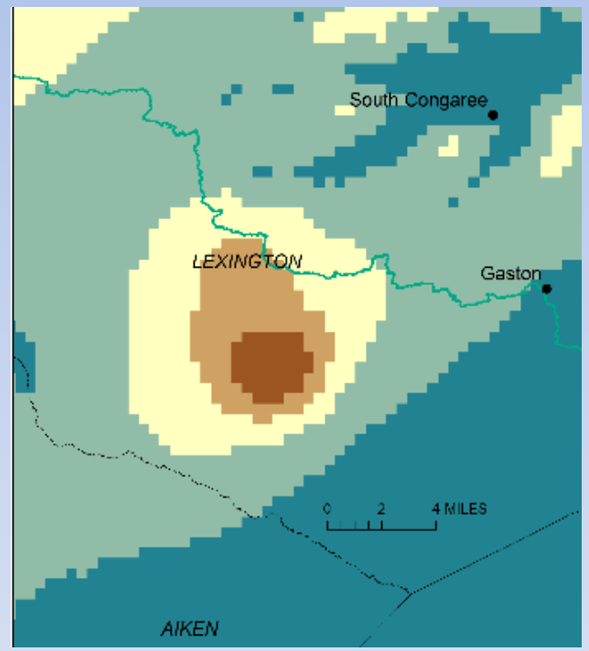
Current (14 MGD)



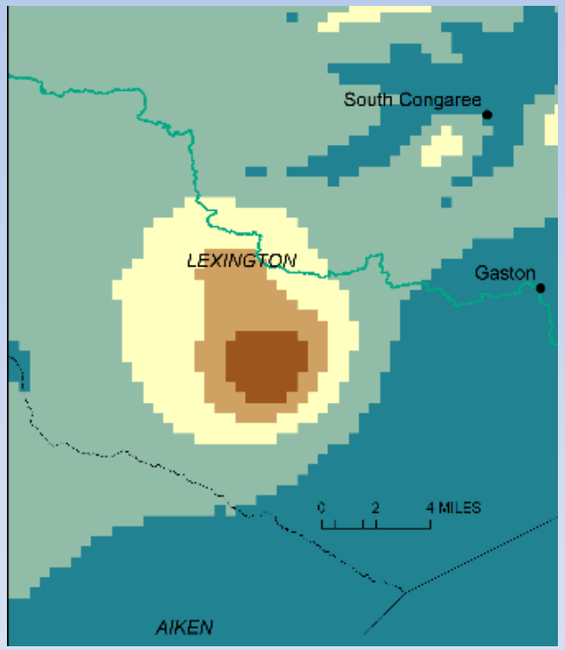
24 feet below top of aquifer

High Growth (23 MGD)



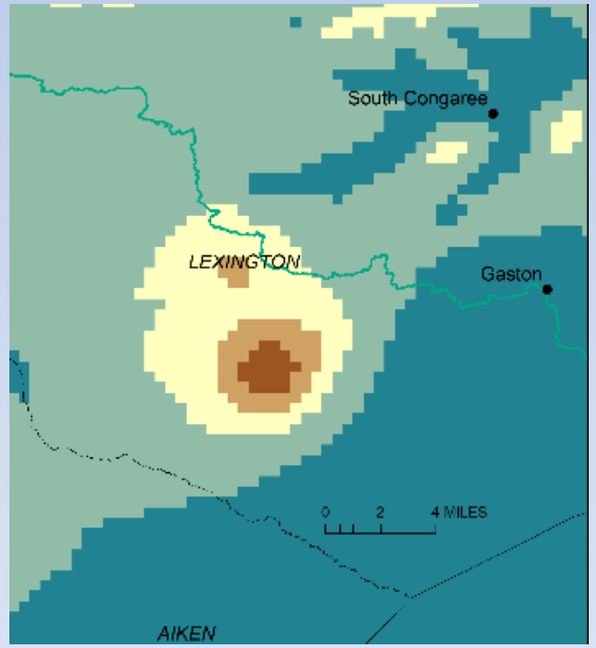
137 feet below top of aquifer

Relocate New Pumping



142 feet below top of aquifer

Combined Scenario: Relocate Pumping and Reduce Irrigation



93 feet below top of aquifer

Legend

- Town location and name
- Edisto Basin Outline

Simulated Head minus Top Elevation of Aquifer in feet (ft)

- Below -50
- -50 to 0
- 0 to 50
- 50 to 100
- Above 100

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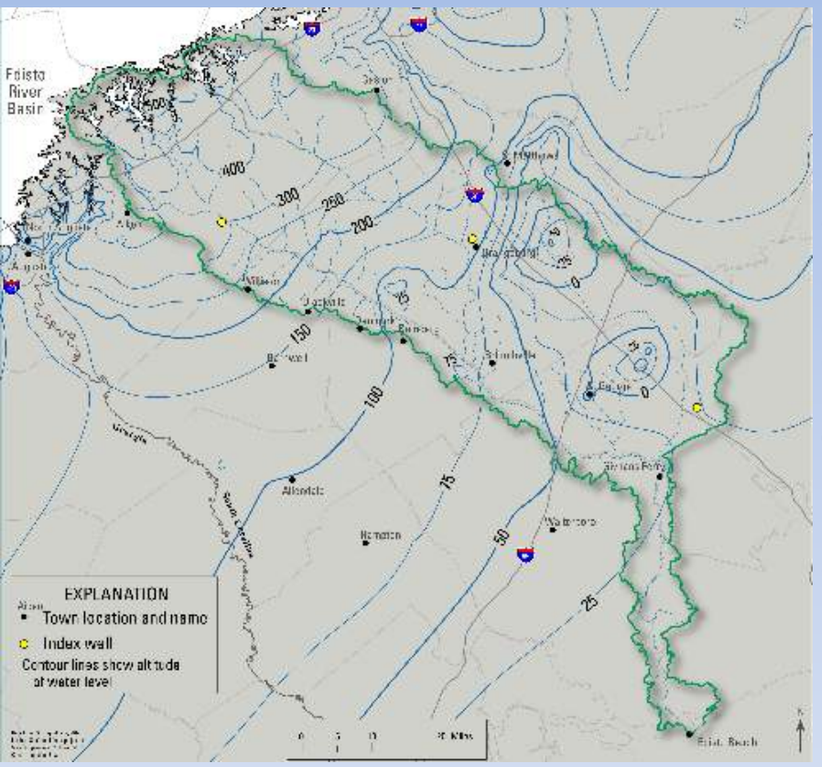
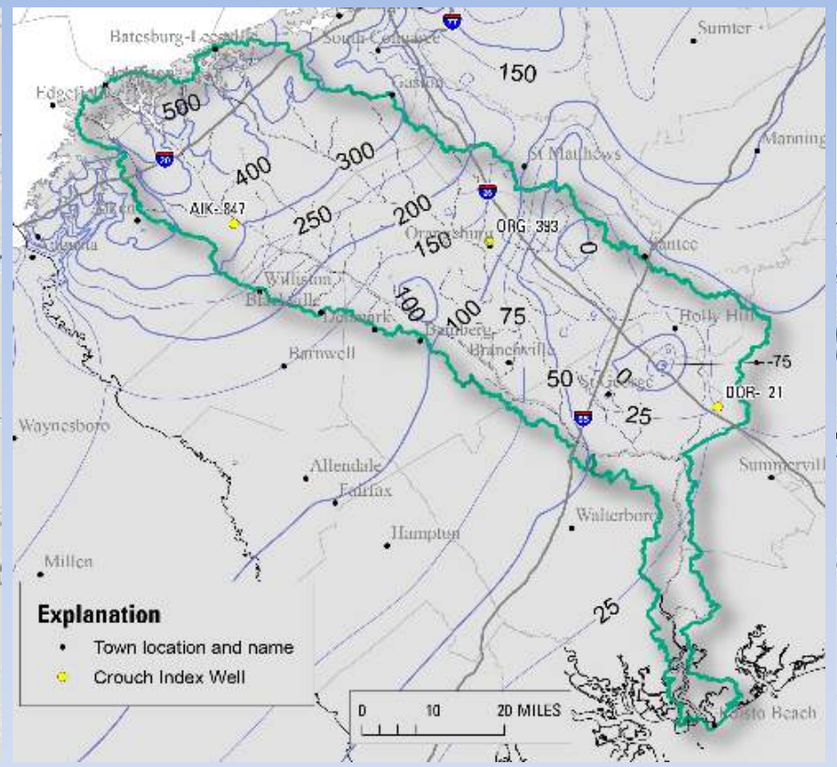
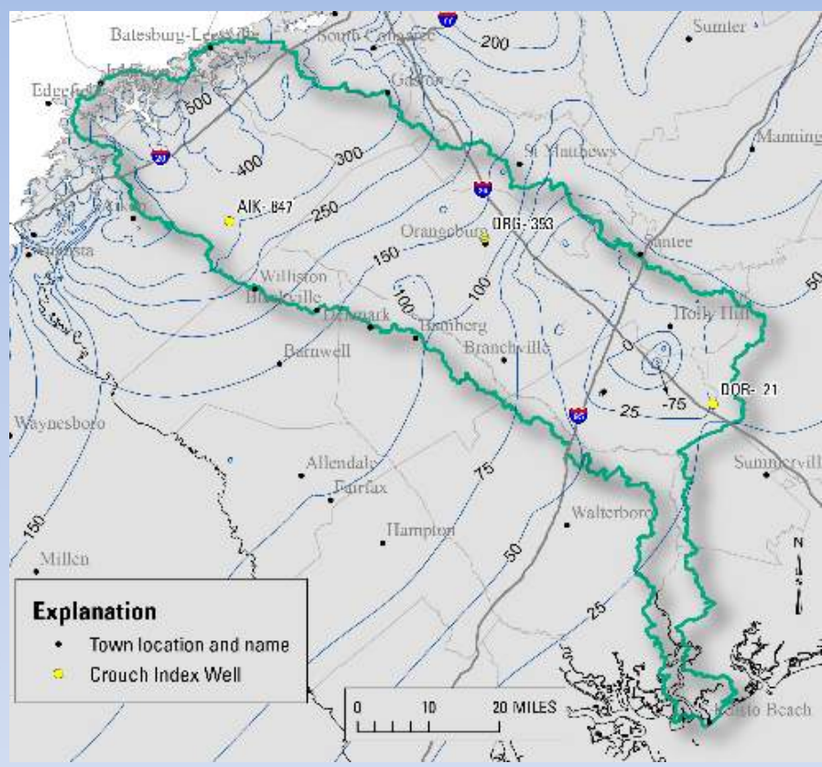
Moderate Growth Scenario Comparison (2070)
Crouch Branch aquifer (layer 9)



Moderate Growth
(69 MGD)



Irrigation Reduced 15%



Combined Scenario
Relocate Pumping and Reduce Irrigation

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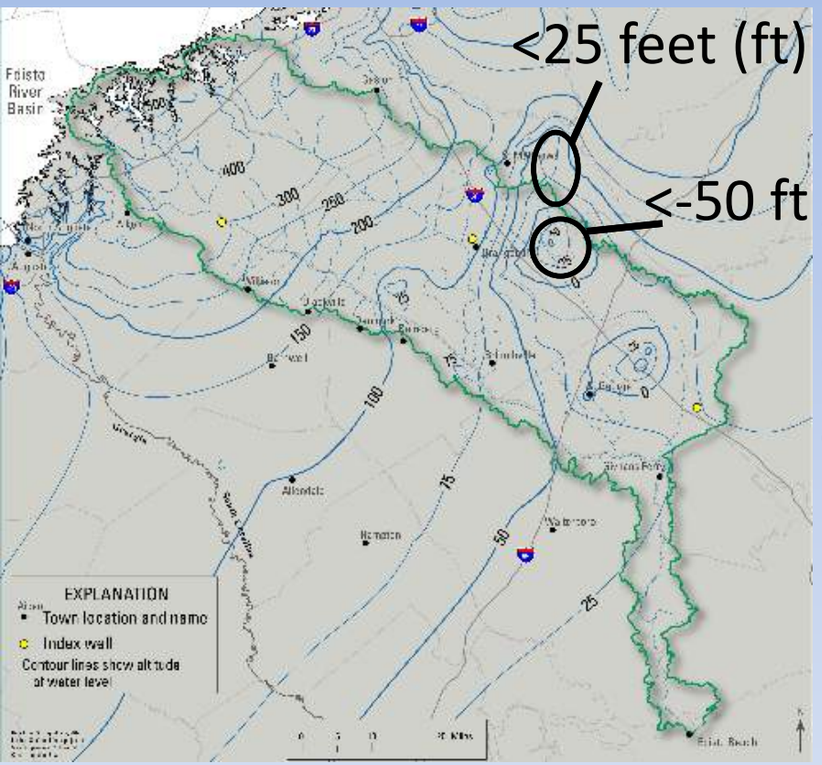
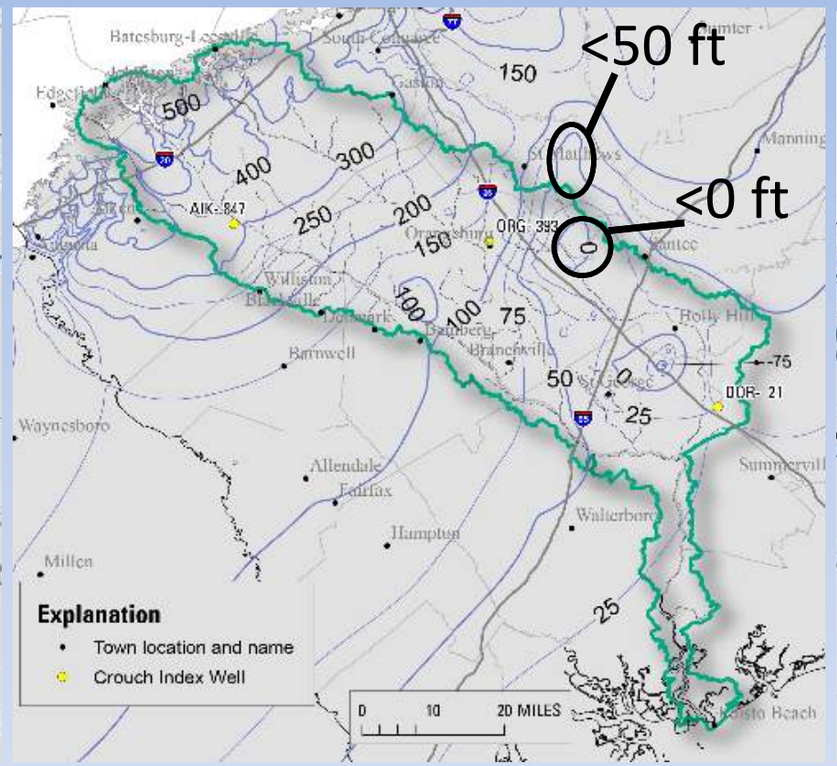
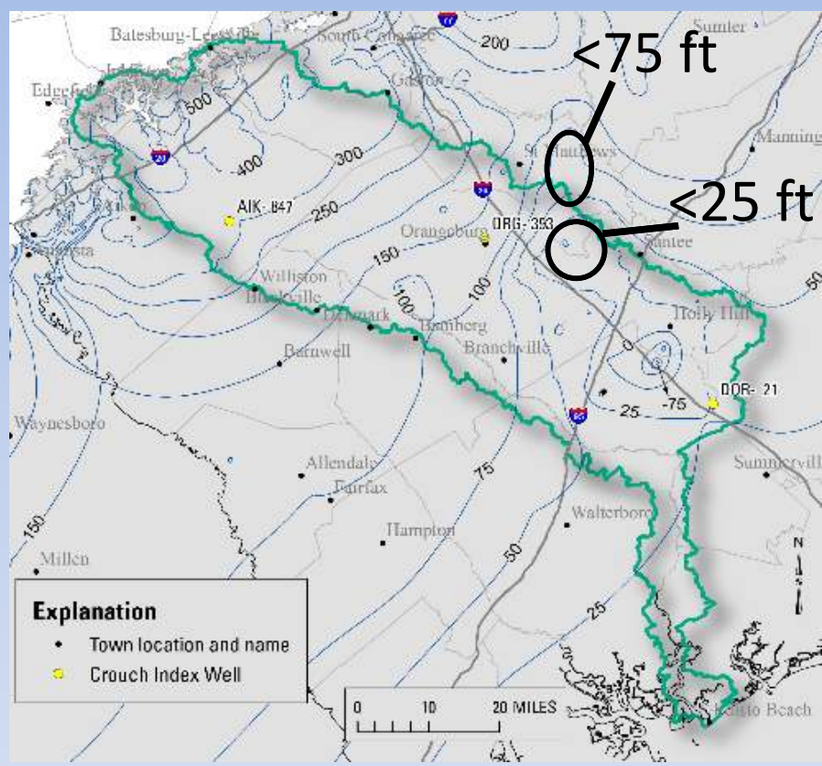
Moderate Growth Scenario Comparison (2070)
Crouch Branch aquifer (layer 9)



Moderate Growth
(69 MGD)



Irrigation Reduced 15%



Combined Scenario
Relocate Pumping and Reduce Irrigation

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U.S. Geological Survey

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Moderate Growth Scenario Comparison (2070)
Crouch Branch aquifer (layer 9)

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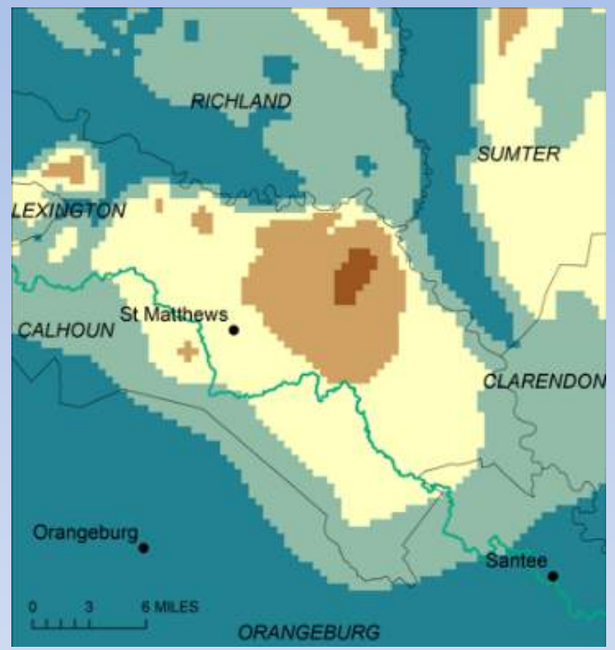
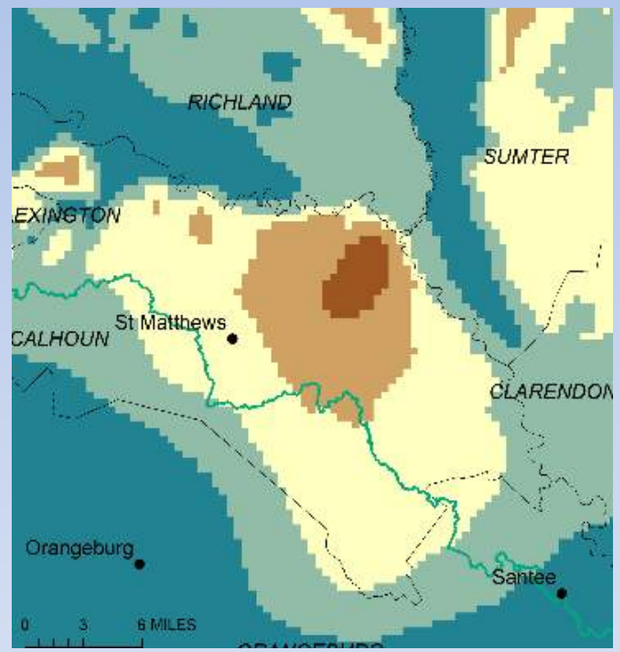
Current (52 MGD)



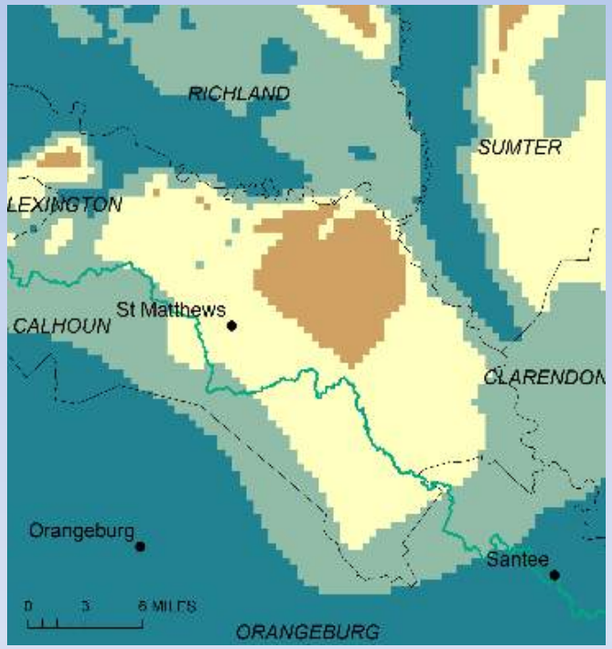
60 feet below top of aquifer

Moderate Growth (69 MGD)



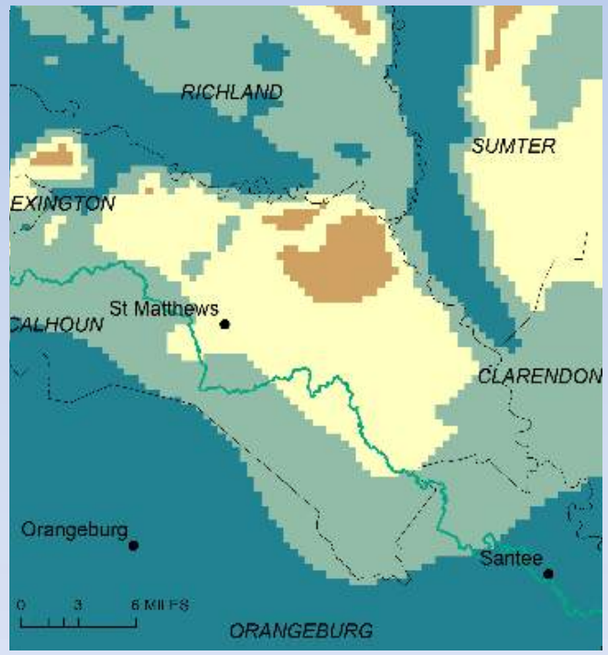
75 feet below top of aquifer

Irrigation Reduced 15%



50 feet below top of aquifer

Combined Scenario: Relocate Pumping and Reduce Irrigation



29 feet below top of aquifer

Legend

- Town location and name
- Edisto Basin Outline

Simulated Head minus Top Elevation of Aquifer in feet (ft)

- Below -50
- -50 to 0
- 0 to 50
- 50 to 100
- Above 100

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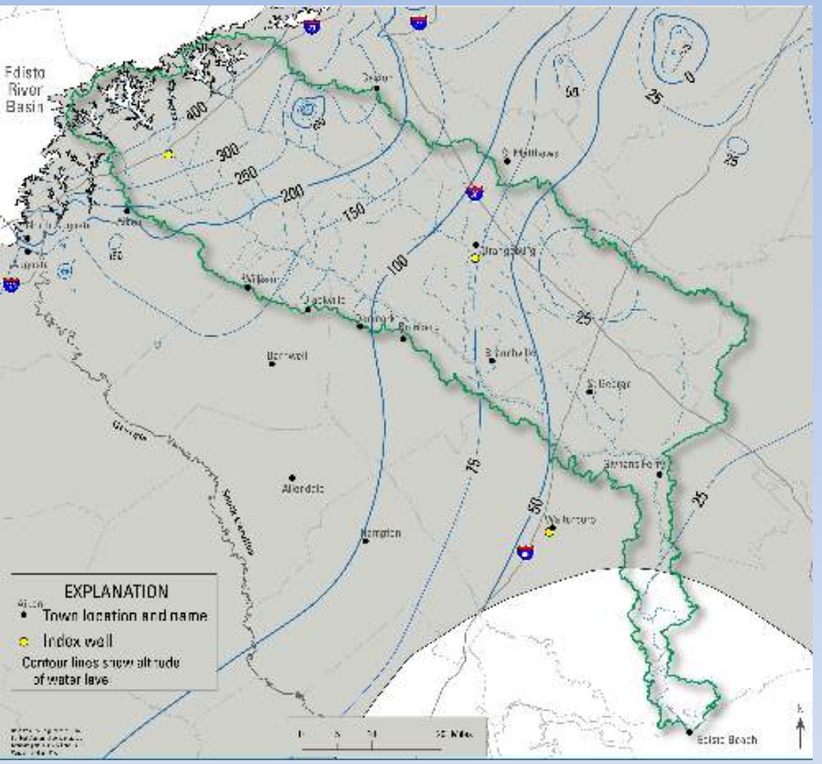
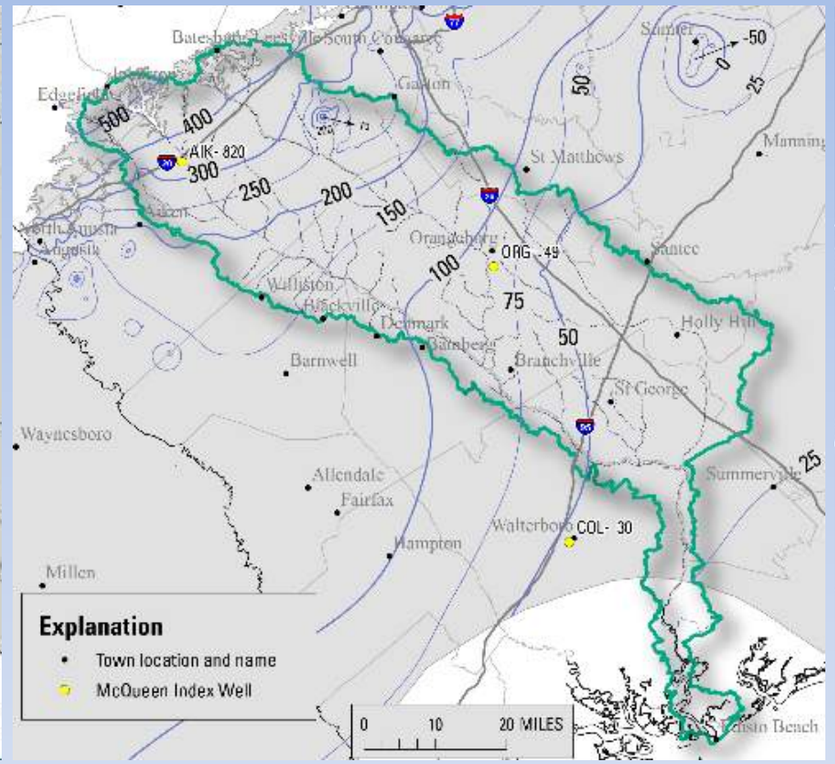
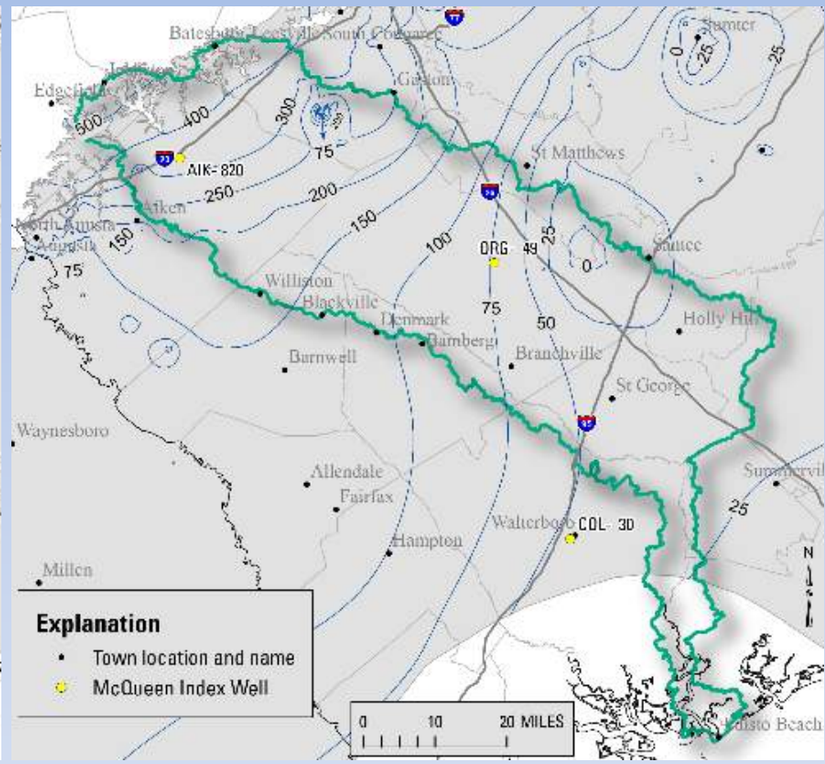
Moderate Growth Scenario Comparison (2070)
McQueen Branch aquifer (layer 11)



Moderate Growth
(20 MGD)



Irrigation Reduced 15%



Combined Scenario
Relocate Pumping and Reduce Irrigation

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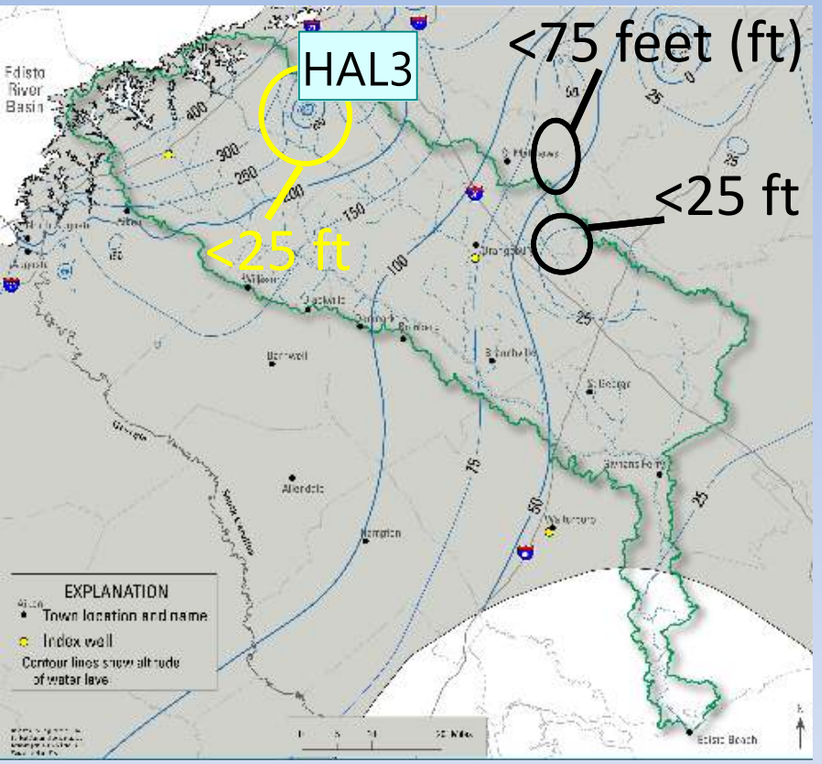
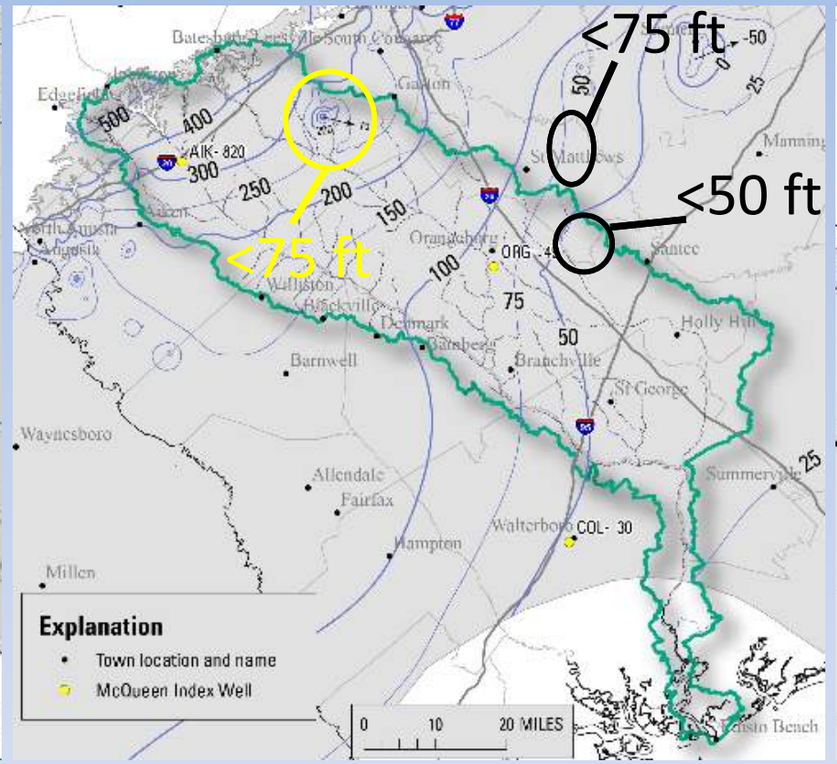
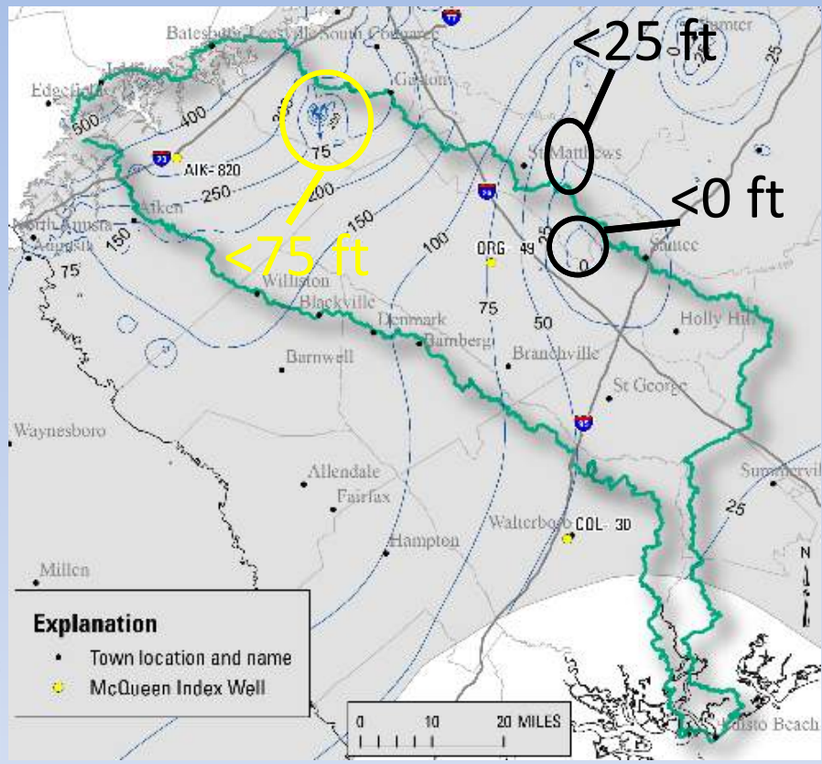
Moderate Growth Scenario Comparison (2070)
McQueen Branch aquifer (layer 11)



Moderate Growth
(20 MGD)



Irrigation Reduced 15%



Combined Scenario
Relocate Pumping and Reduce Irrigation

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Slide 14

HAL3 Same as before the focus is the cone of depression near Lexington for the McQueen Branch Aquifer.
Hughes, Andrea L, 6/19/2022

Moderate Growth Scenario Comparison (2070)
McQueen Branch aquifer (layer 11)

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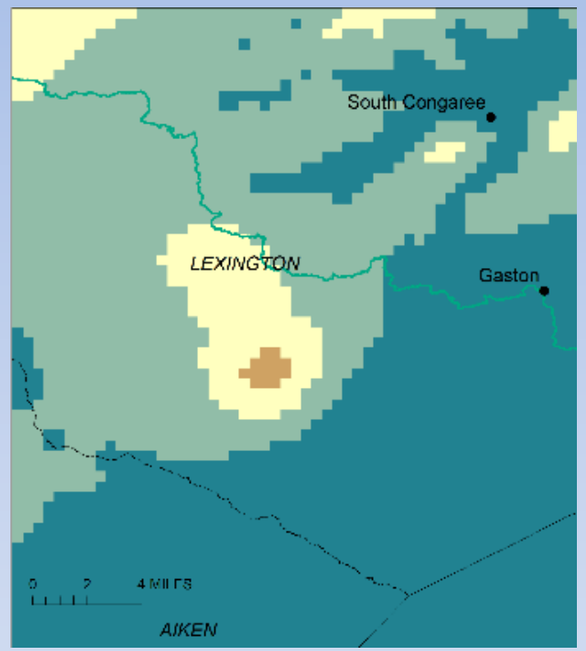
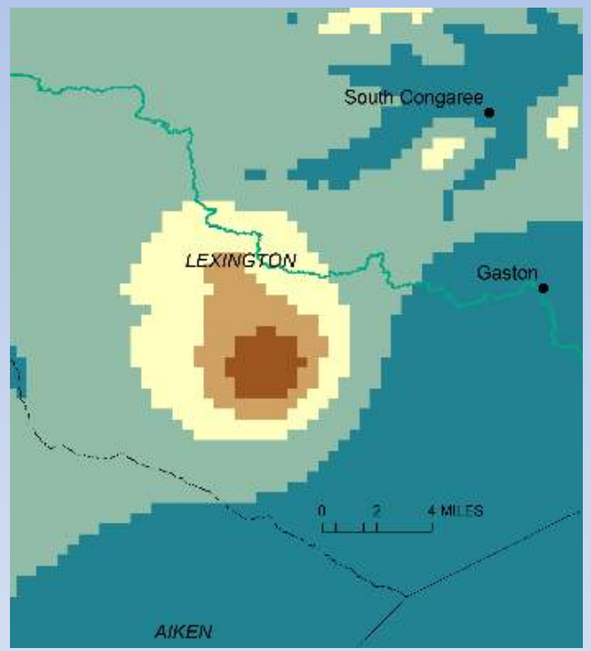
Current (14 MGD)



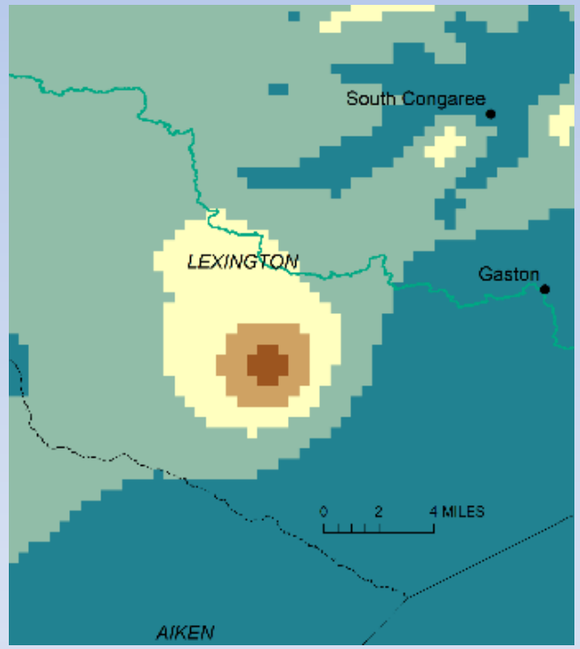
24 feet below top of aquifer

Moderate Growth (20 MGD)



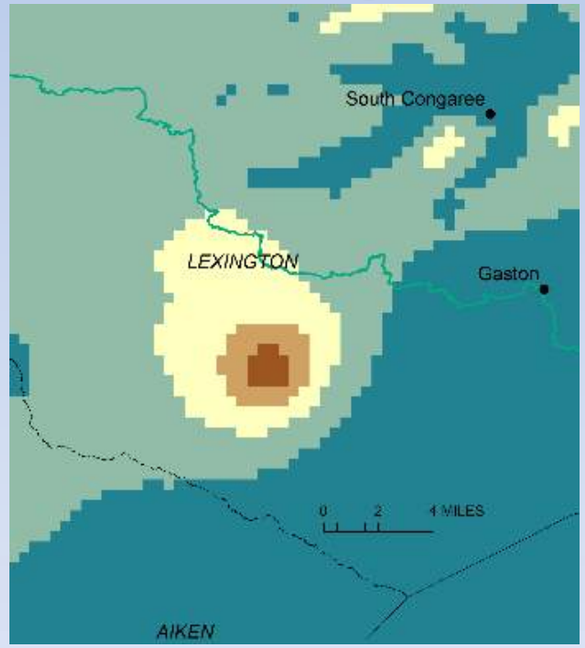
130 feet below top of aquifer

Irrigation Reduced 15%



84 feet below top of aquifer

Combined Scenario: Relocate Pumping and Reduce Irrigation



91 feet below top of aquifer

Legend

- Town location and name
- Edisto Basin Outline

Simulated Head minus Top Elevation of Aquifer in feet (ft)

- Below -50
- -50 to 0
- 0 to 50
- 50 to 100
- Above 100

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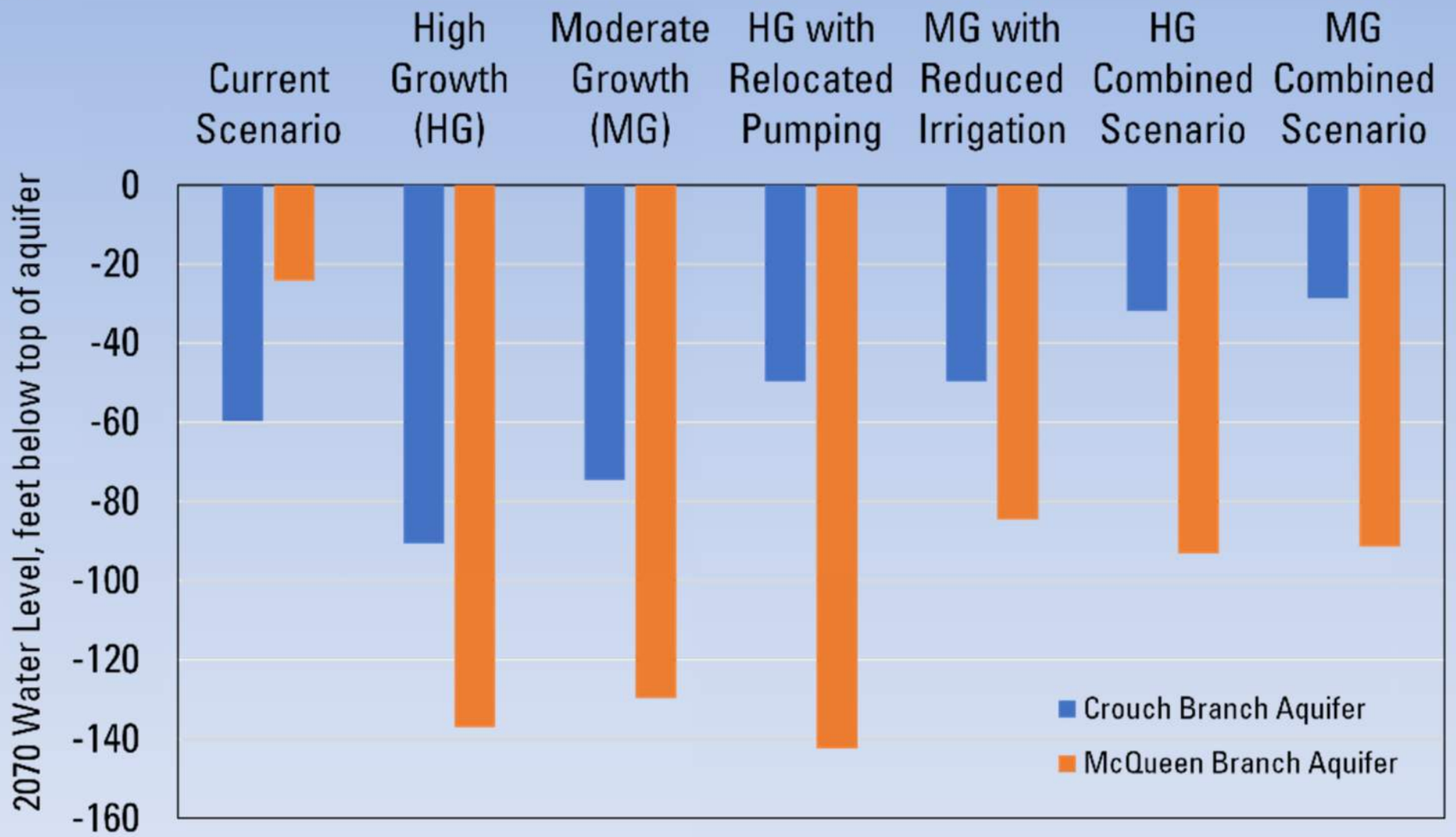
Maximum Breach of Aquifer Depths at Areas of Concern



Zero for the vertical axis is the location of the top of each aquifer.

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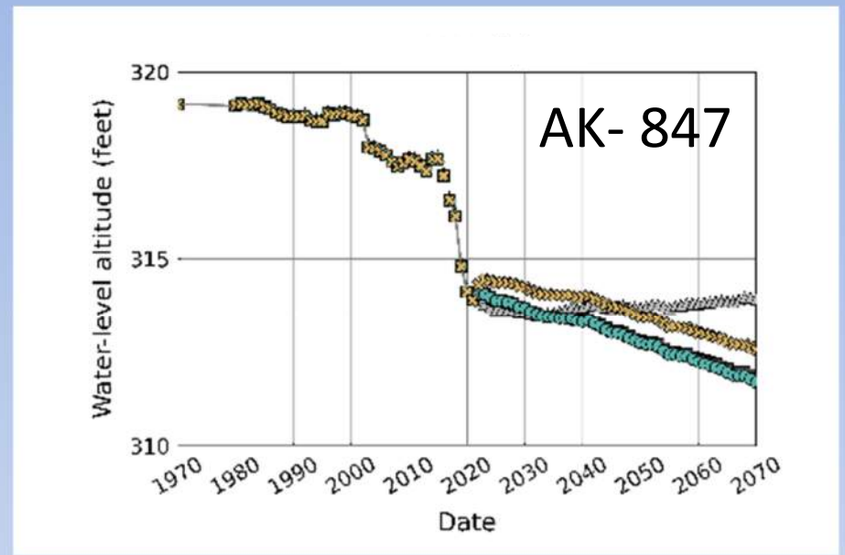
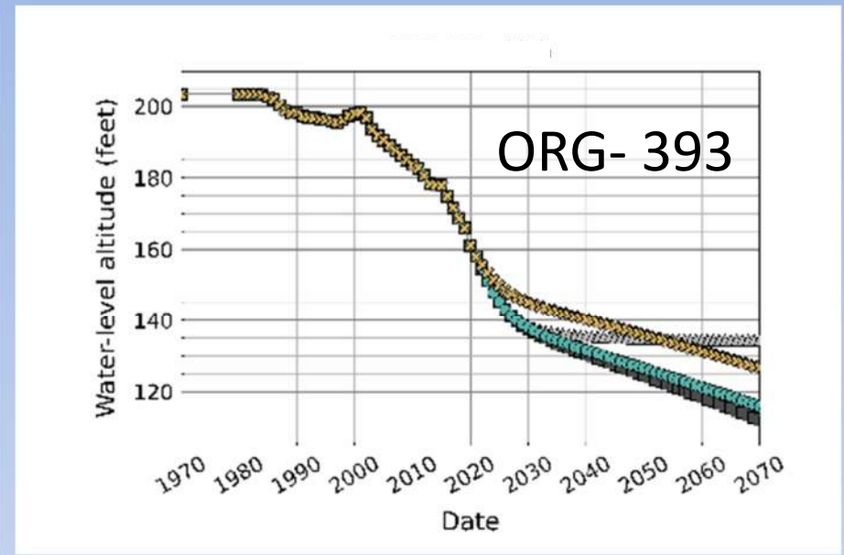
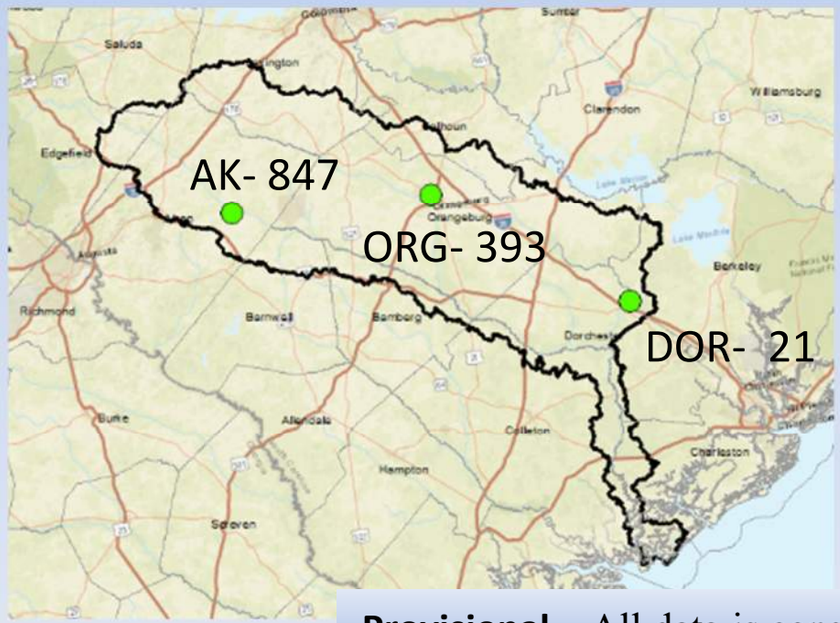
Simulated water levels in the Crouch Branch aquifer

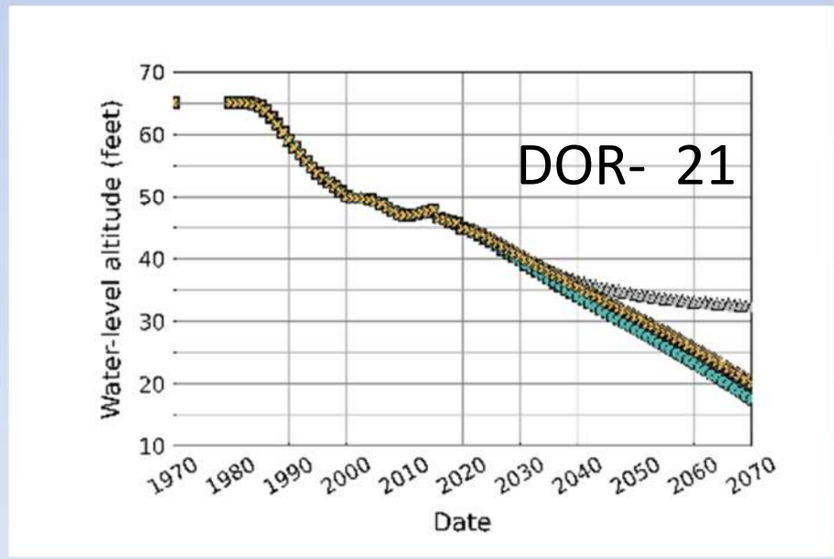




EXPLANATION

- Current
- High Growth
- Relocate Pumping
- Combined Scenarios





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U.S. Geological Survey

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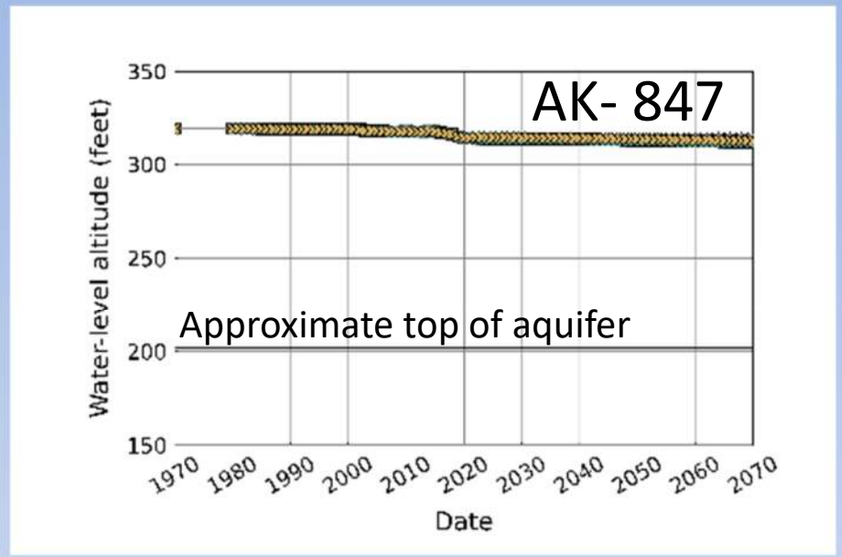
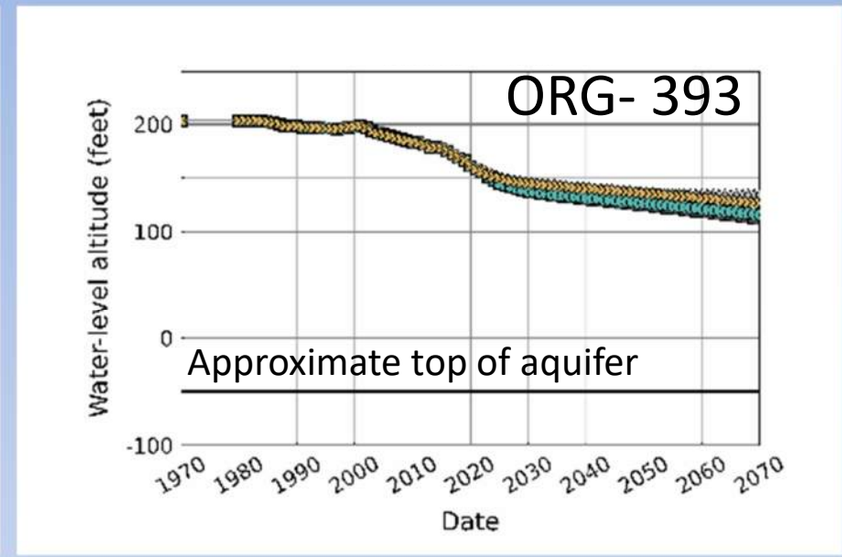
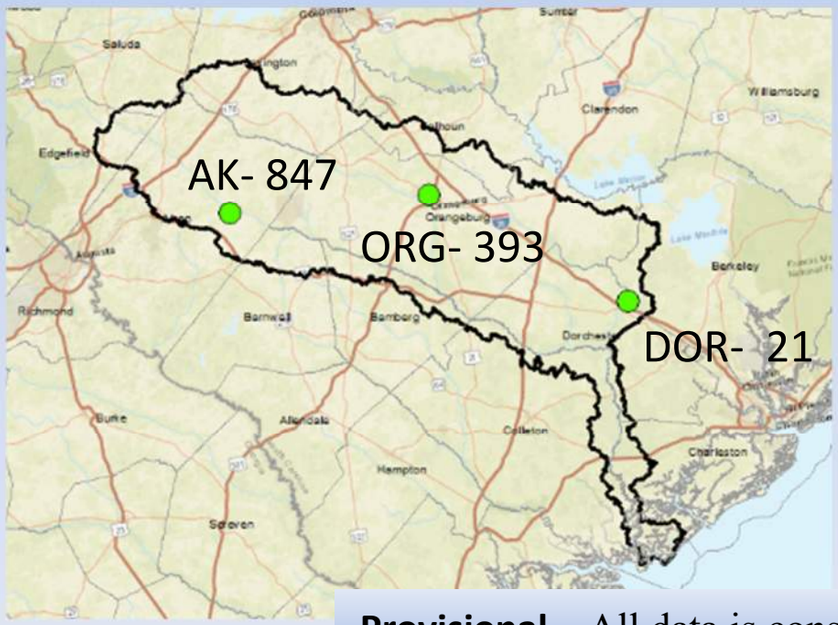
Simulated water levels in the Crouch Branch aquifer showing approximate top of aquifer

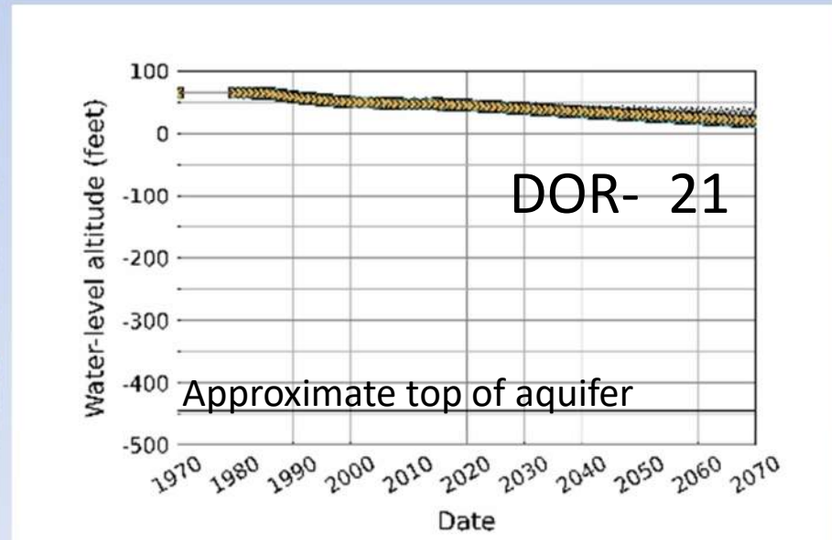




EXPLANATION

- Current
- High Growth
- Relocate Pumping
- Combined Scenarios





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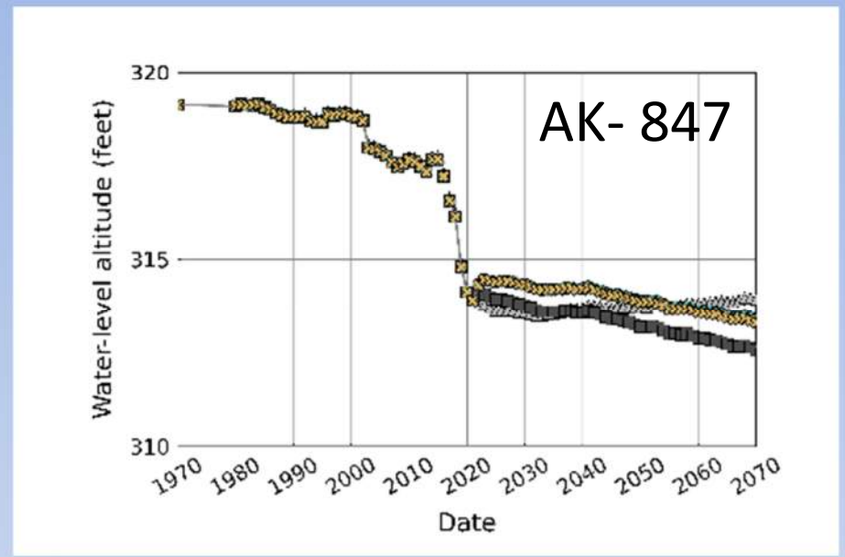
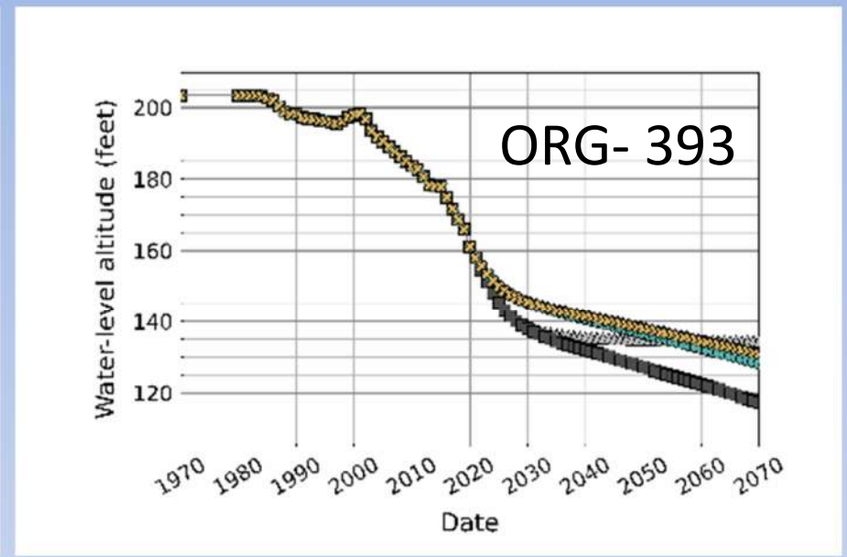
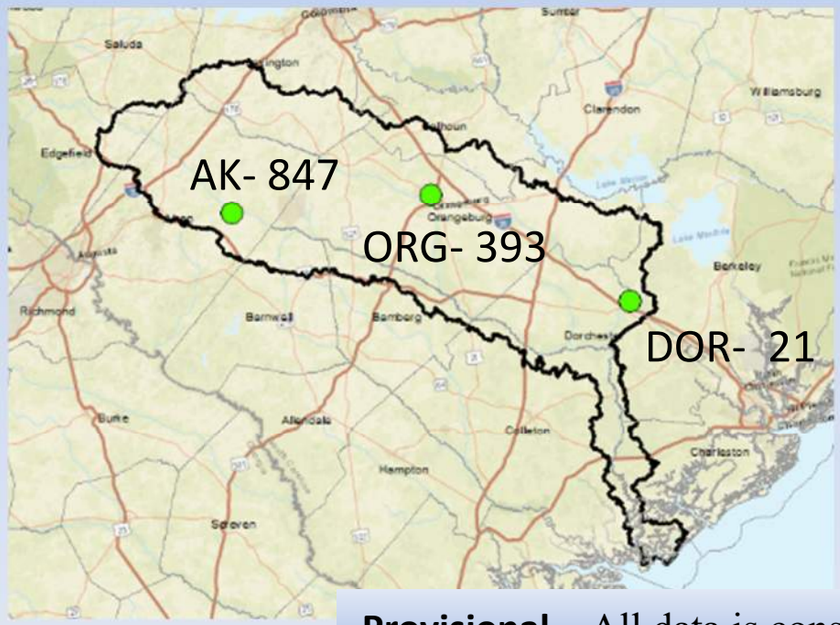
Simulated water levels in the Crouch Branch aquifer

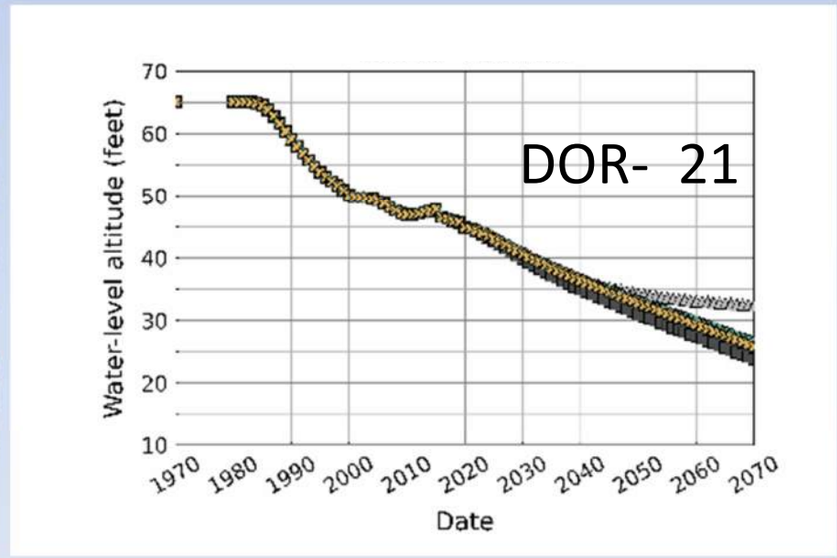




EXPLANATION

- Current
- Moderate Growth
- Reduce Irrigation
- Combined Scenarios





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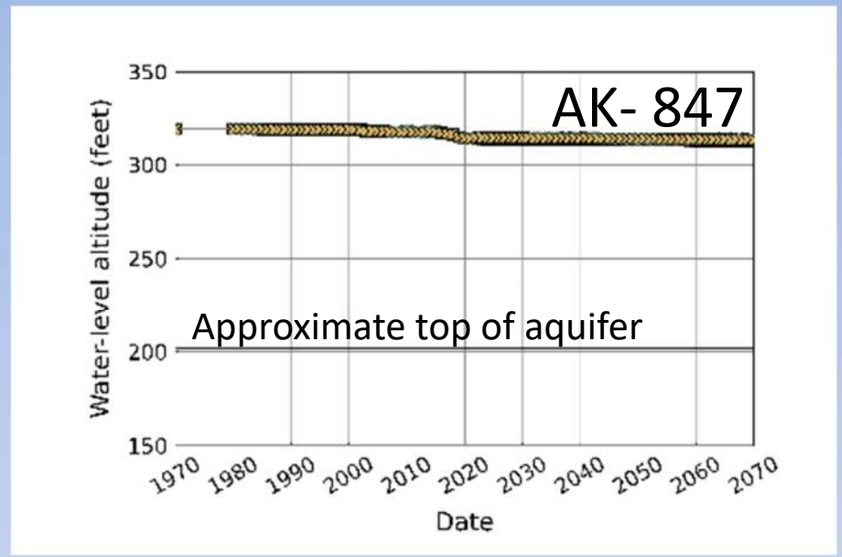
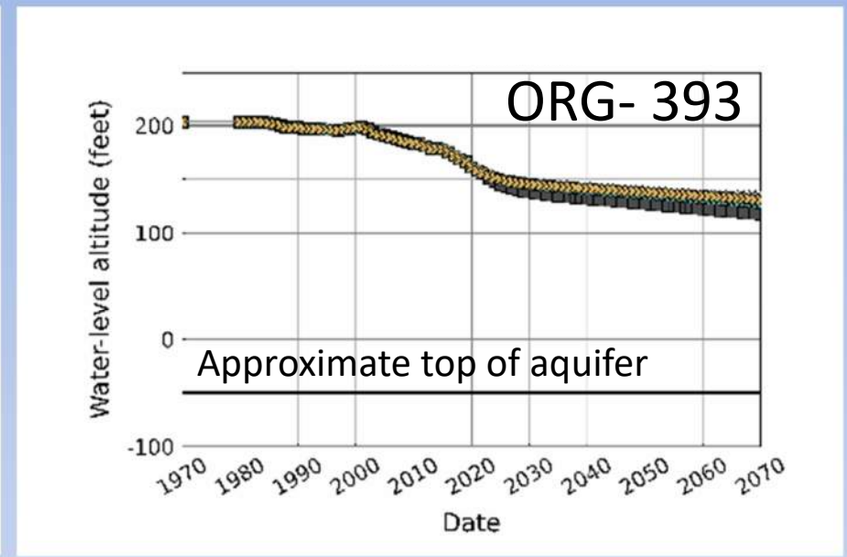
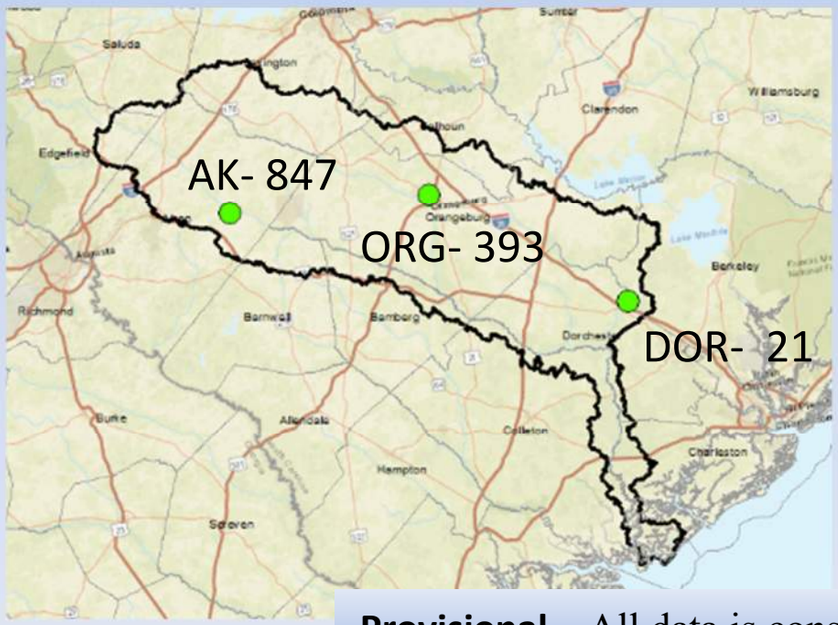
Simulated water levels in the Crouch Branch aquifer showing approximate top of aquifer

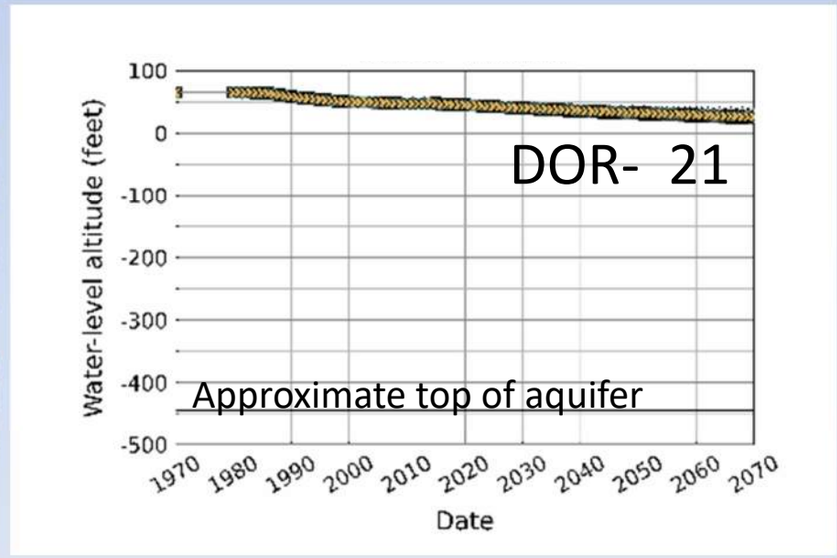




EXPLANATION

- Current
- Moderate Growth
- Reduce Irrigation
- Combined Scenarios





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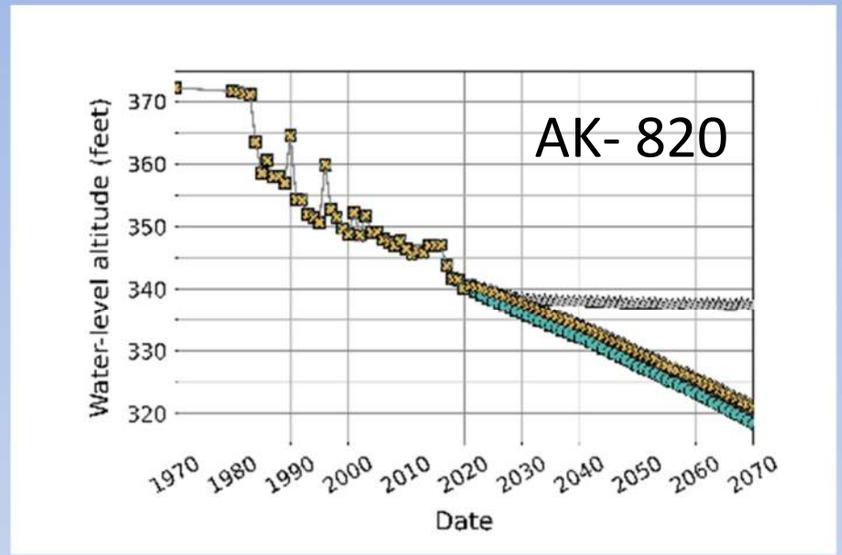
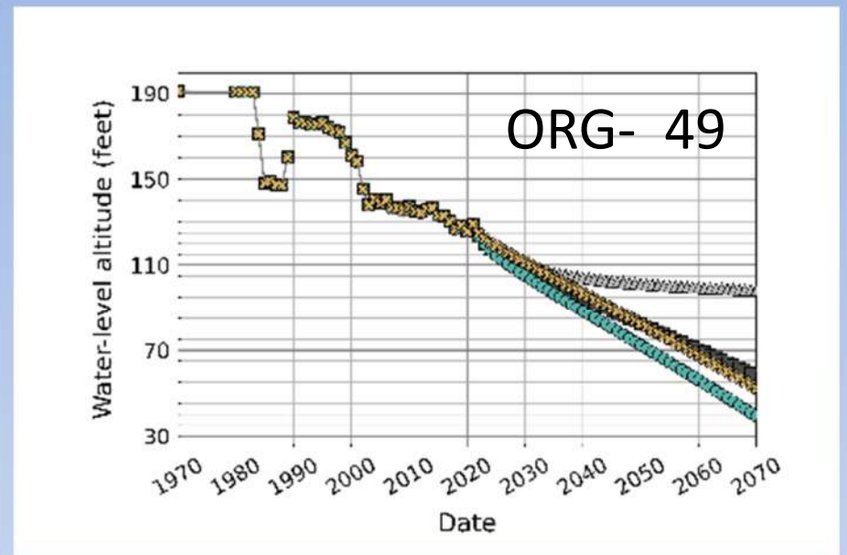
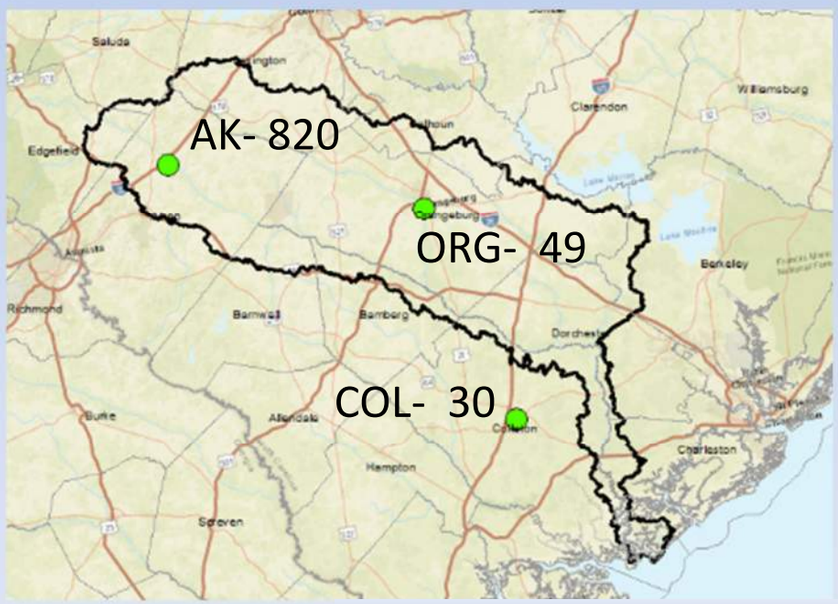
Simulated water levels in the McQueen Branch aquifer

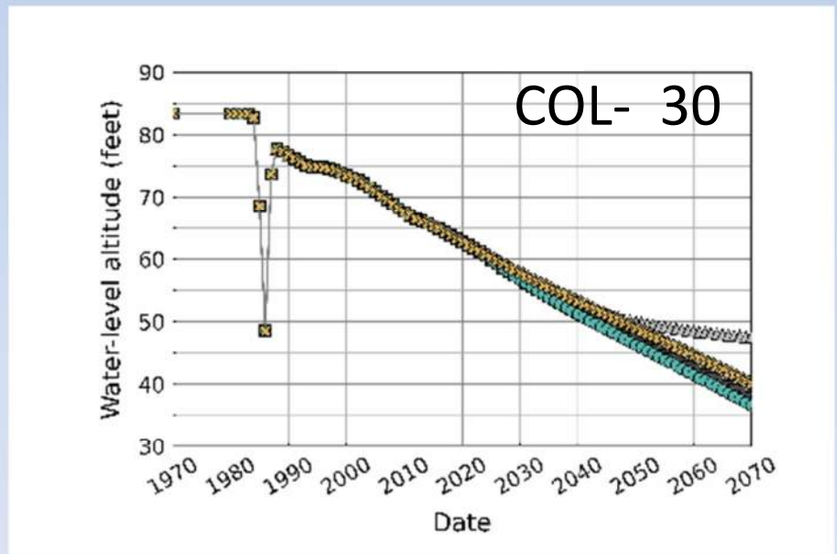




EXPLANATION

- Current
- High Growth
- Relocate Pumping
- Combined Scenarios





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Simulated water levels in the McQueen Branch aquifer showing approximate top of aquifer

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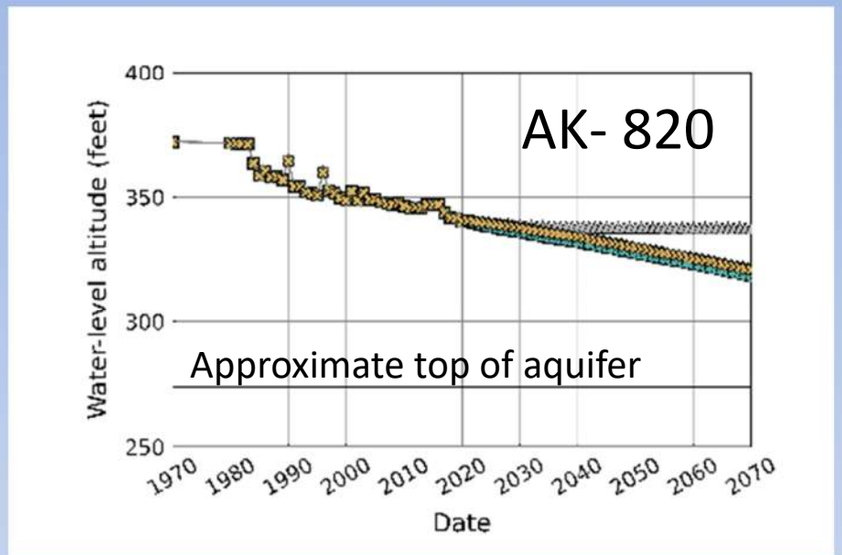
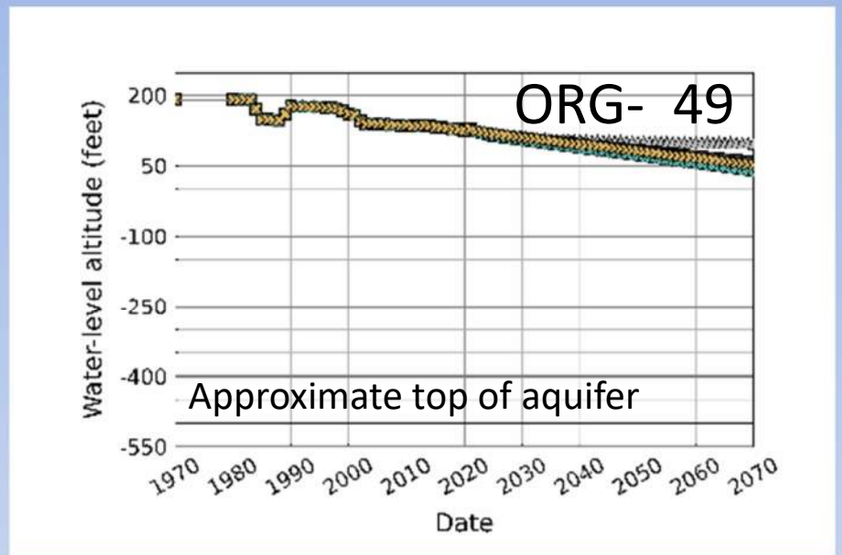
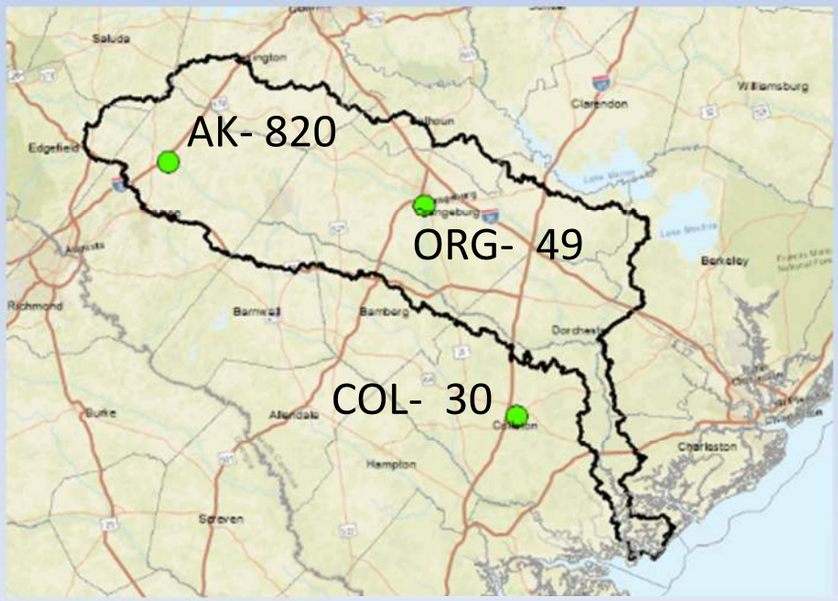
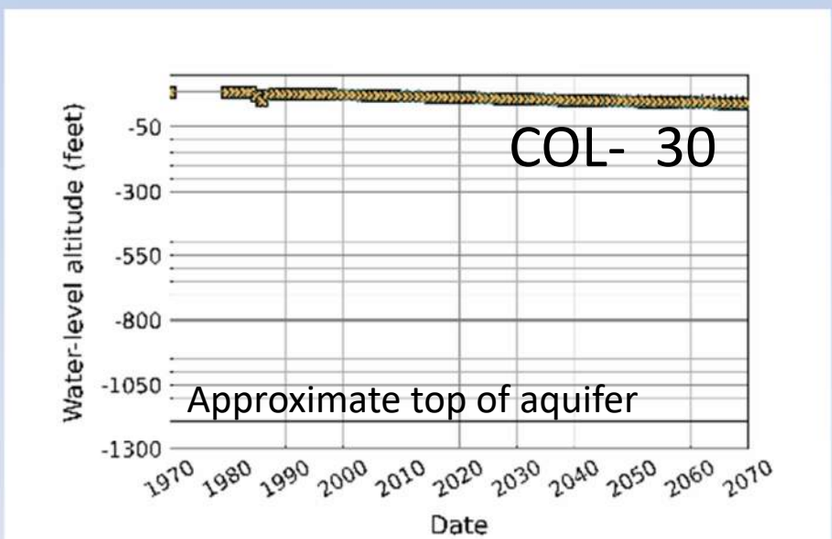




EXPLANATION

- Current
- High Growth
- Relocate Pumping
- Combined Scenarios





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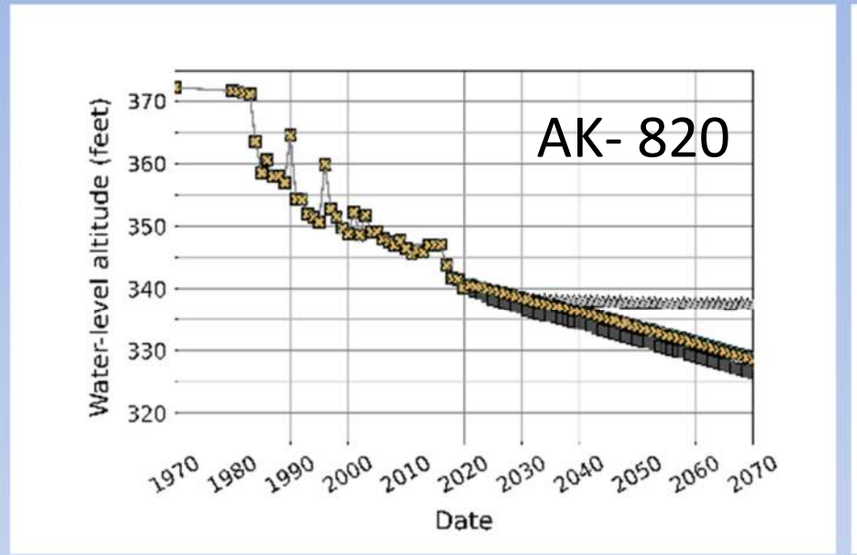
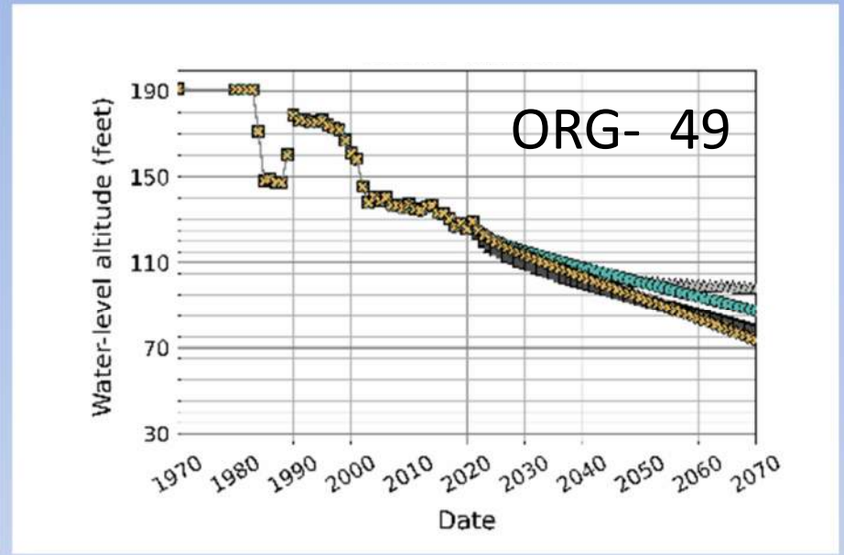
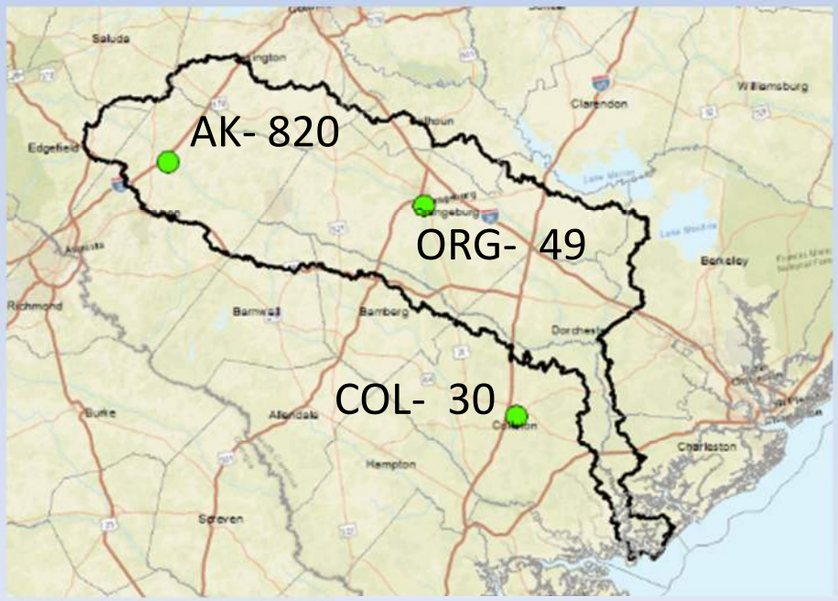
Simulated water levels in the McQueen Branch aquifer

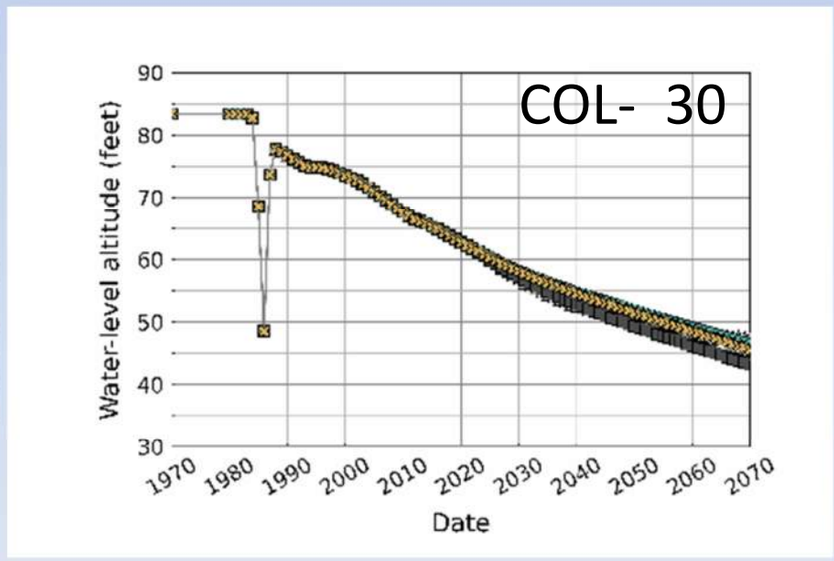




EXPLANATION

- Current
- Moderate Growth
- Reduce Irrigation
- Combined Scenarios





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Simulated water levels in the McQueen Branch aquifer showing approximate top of aquifer

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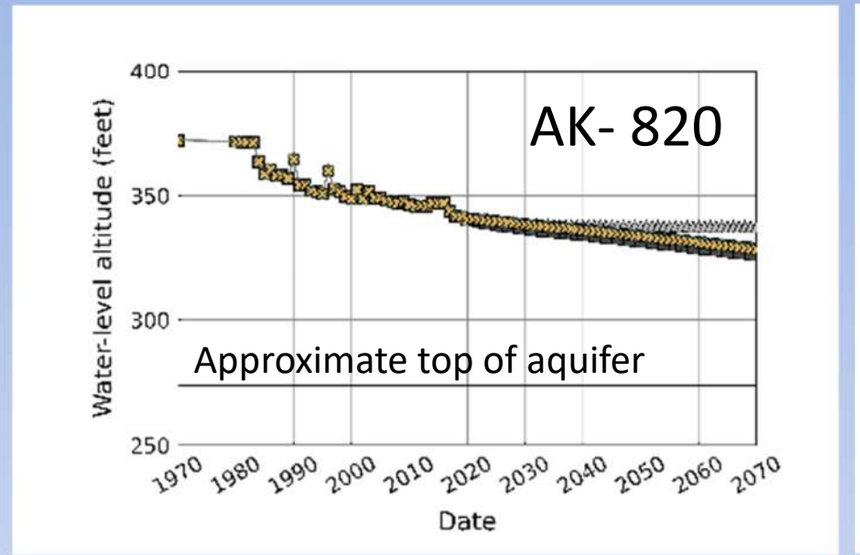
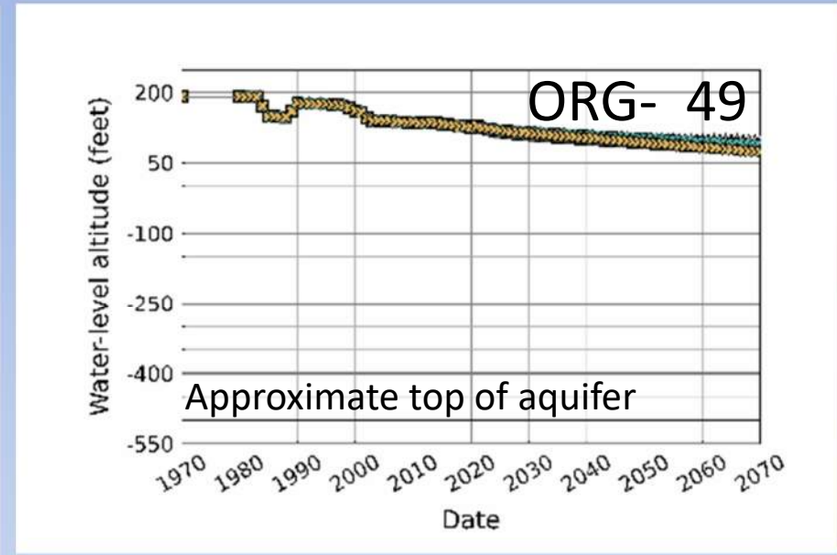
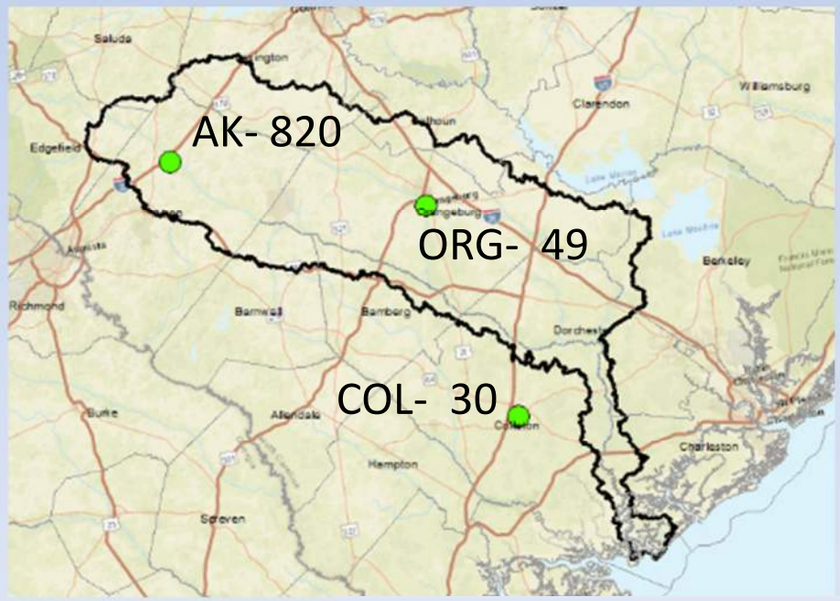
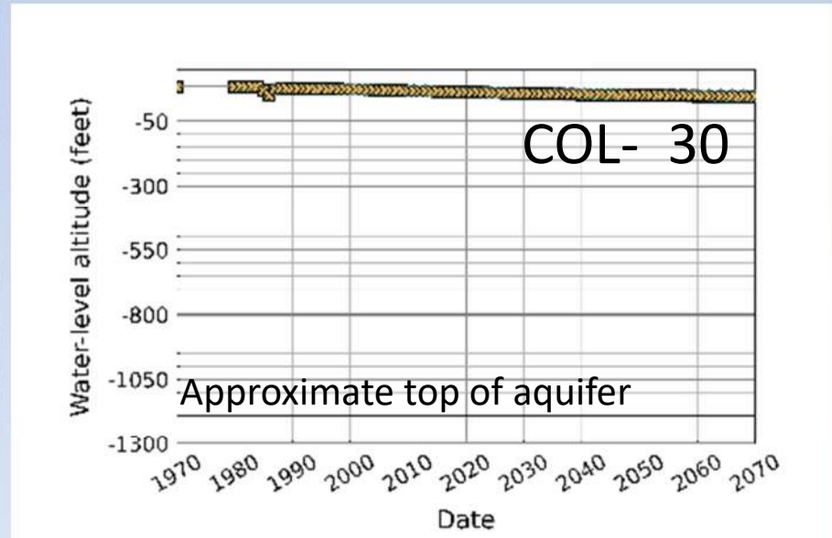




EXPLANATION

- Current
- Moderate Growth
- Reduce Irrigation
- Combined Scenarios





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Andrea Hughes
ahughes@usgs.gov
803-543-4729

Greg Cherry
gccherry@usgs.gov
470-557-0868

Matt Petkewich
mdpetkew@usgs.gov
803-727-9041

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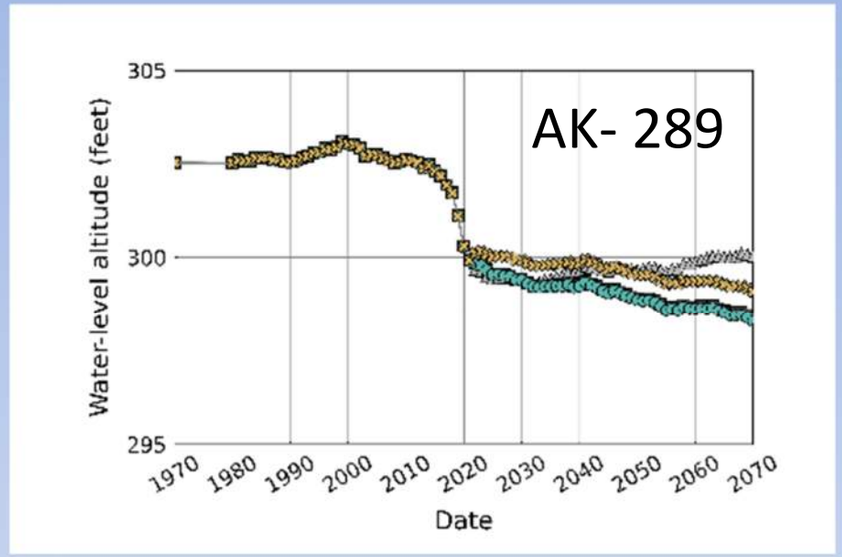
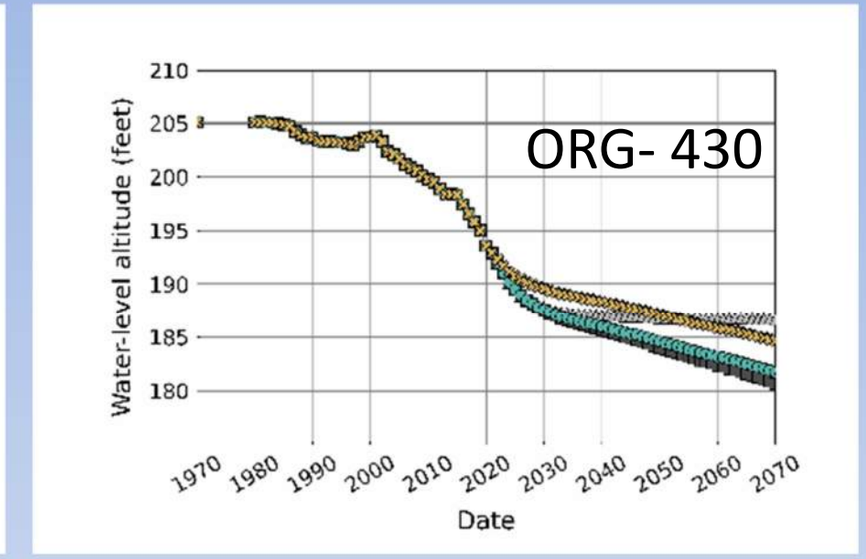
Supplemental slides

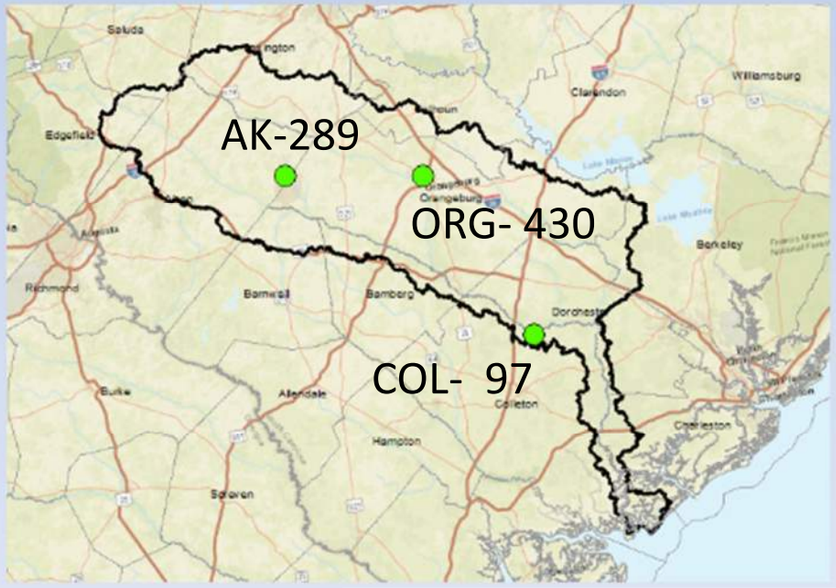
Simulated water levels in the Gordon aquifer

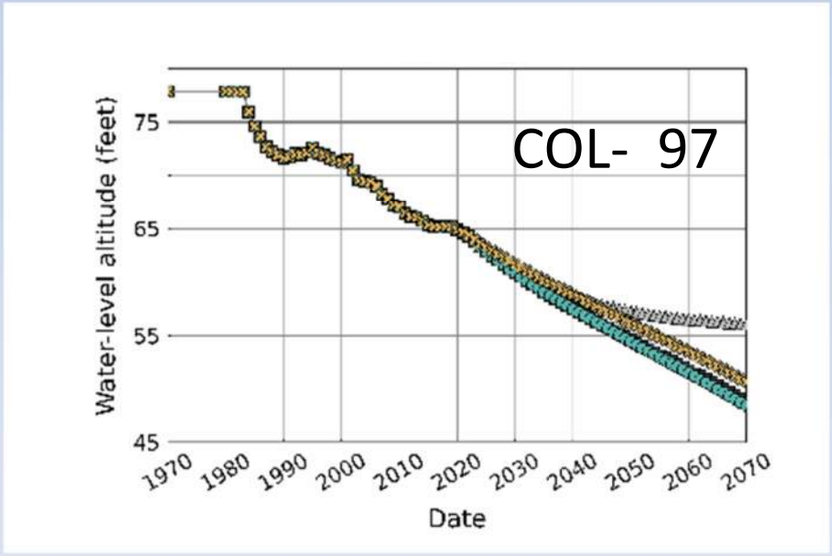




EXPLANATION

- Current
- High Growth
- Relocate Pumping
- Combined Scenarios





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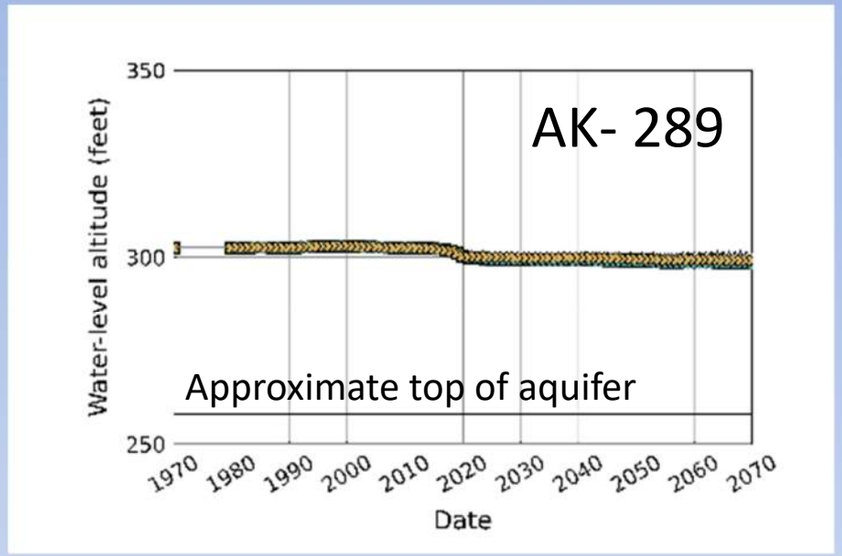
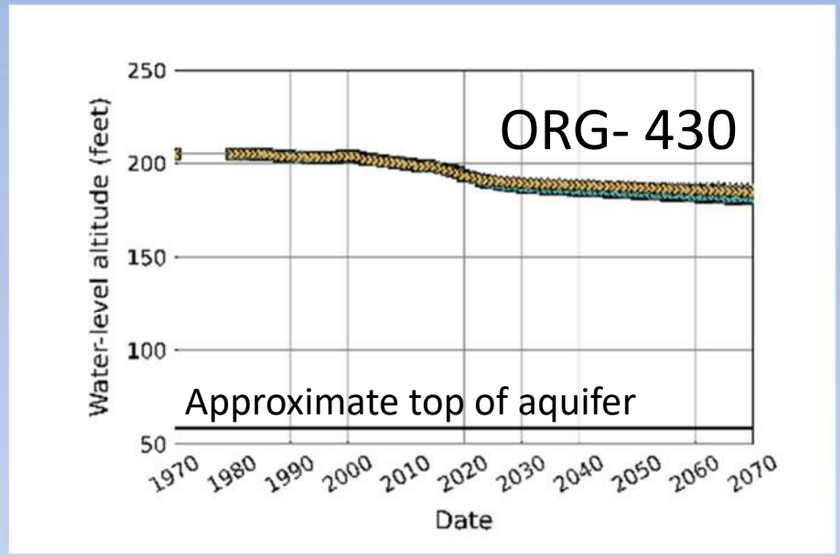
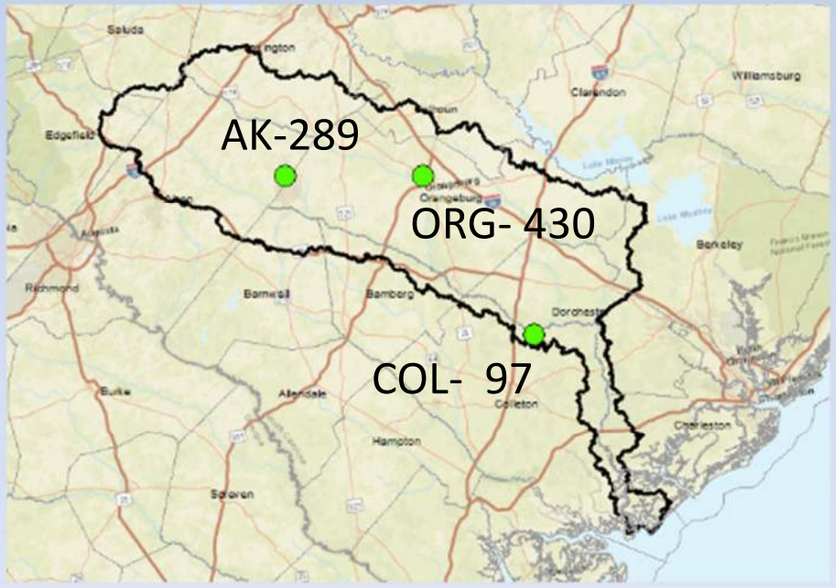
Simulated water levels in the Gordon aquifer showing approximate top of aquifer

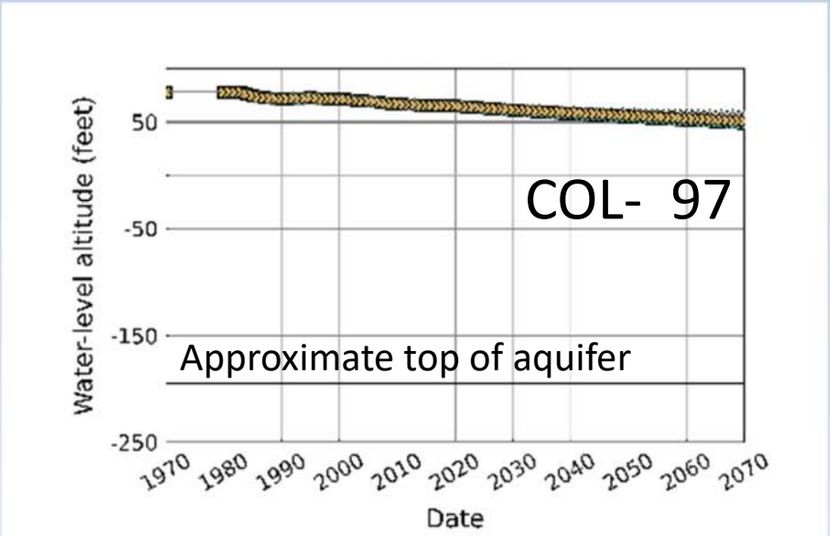




EXPLANATION

- Current
- High Growth
- Relocate Pumping
- Combined Scenarios





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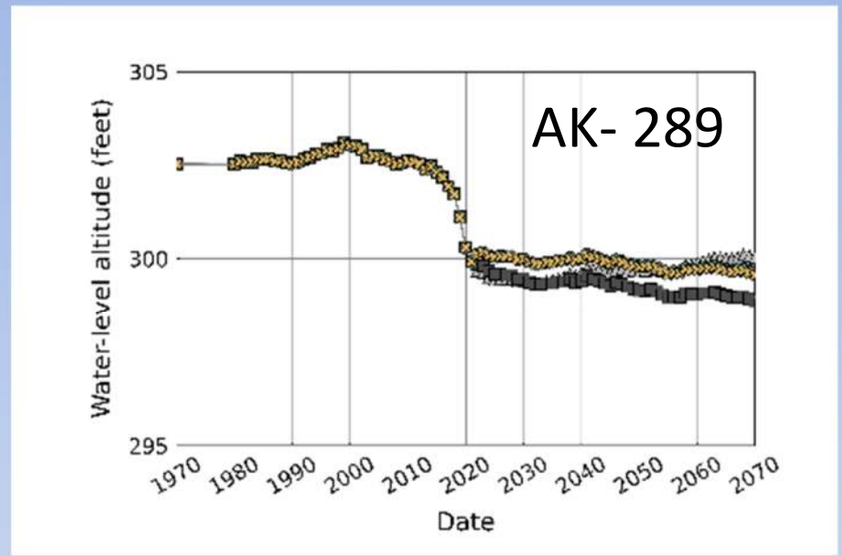
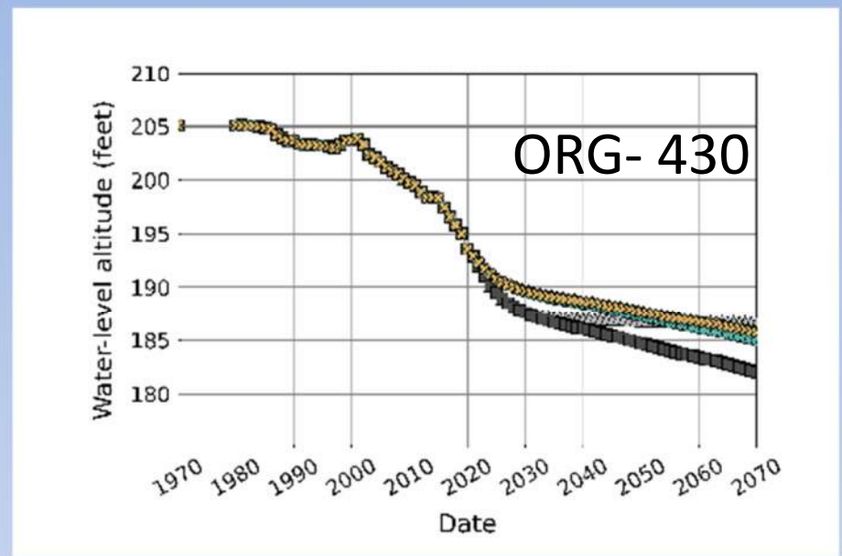
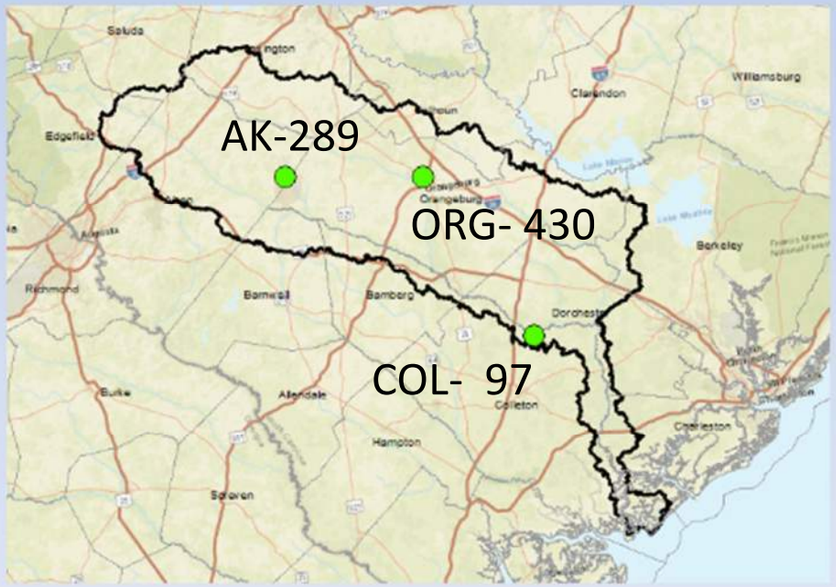
Simulated water levels in the Gordon aquifer

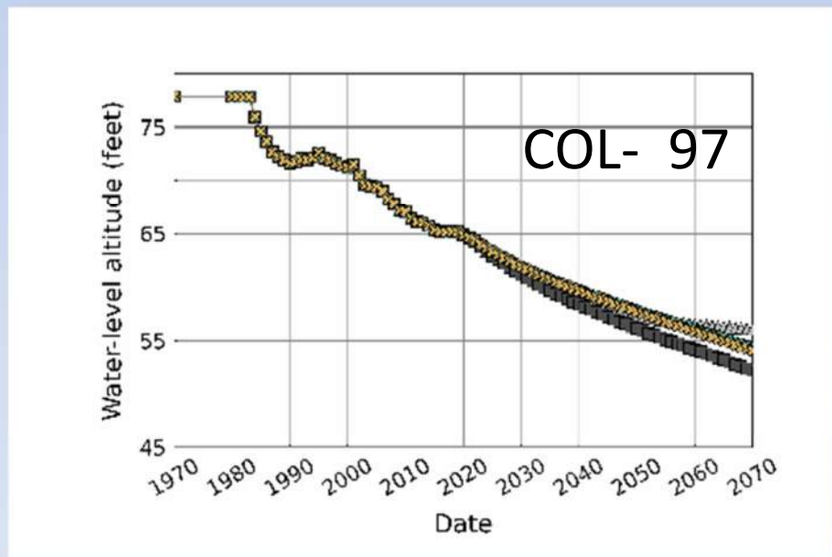




EXPLANATION

- Current
- Moderate Growth
- Reduce Irrigation
- Combined Scenarios





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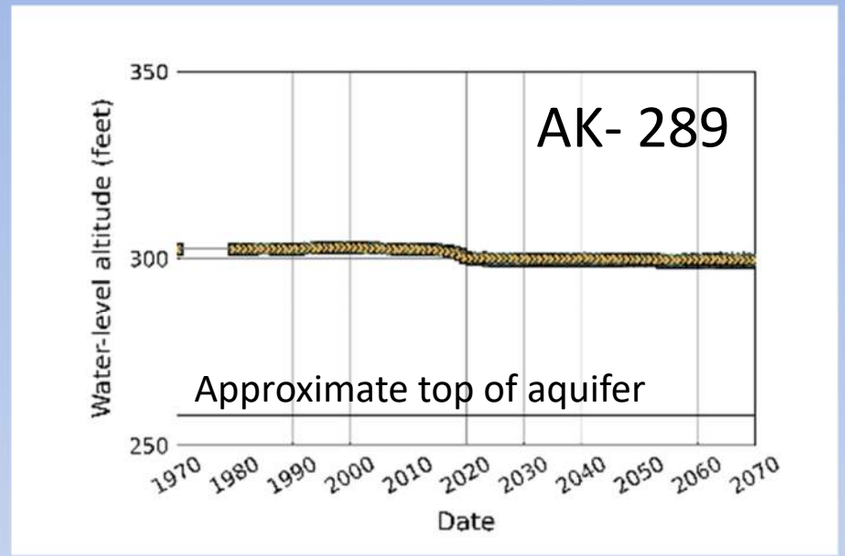
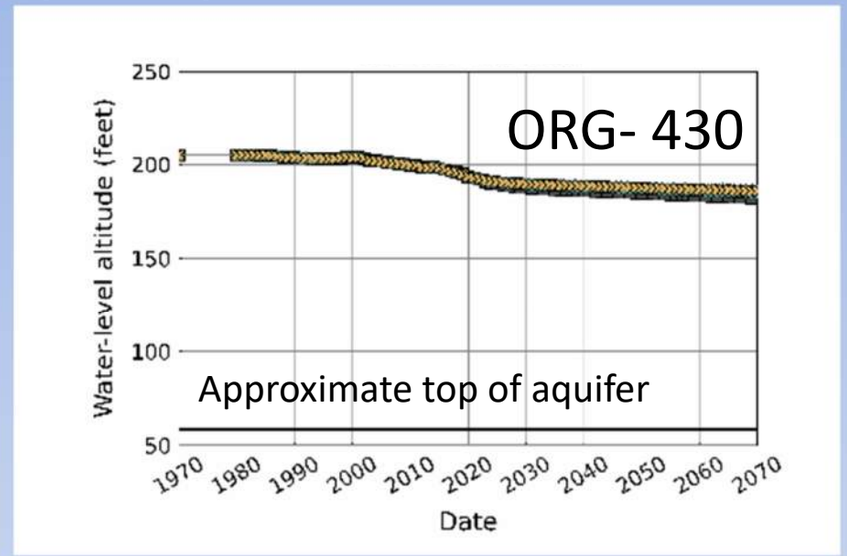
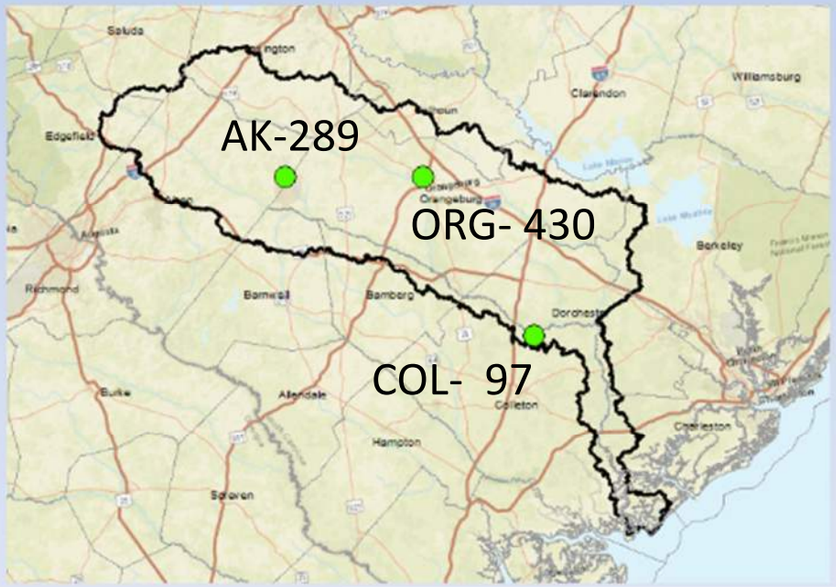
Simulated water levels in the Gordon aquifer showing approximate top of aquifer

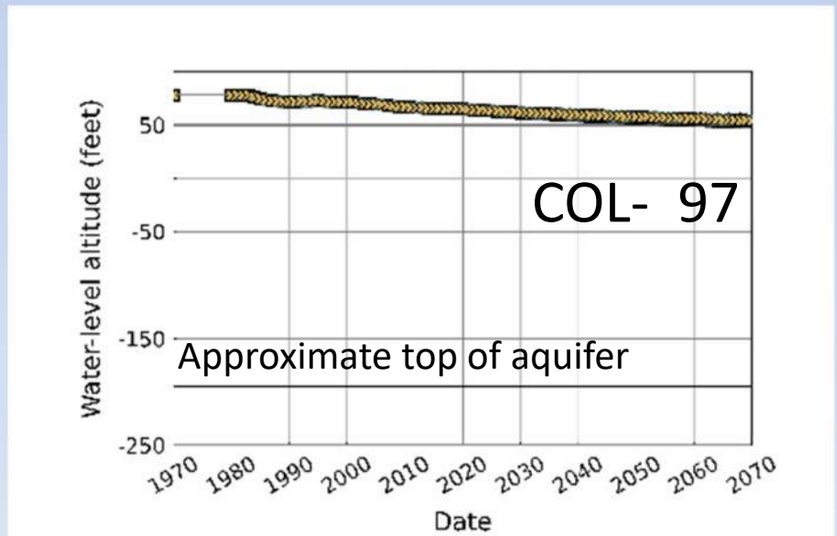




EXPLANATION

- Current
- Moderate Growth
- Reduce Irrigation
- Combined Scenarios





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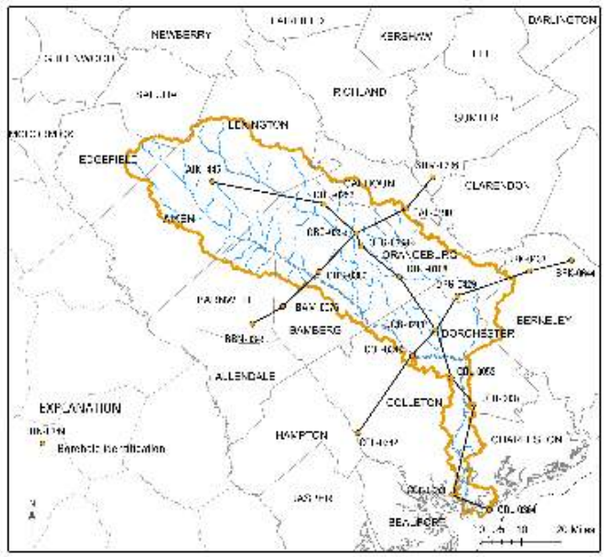
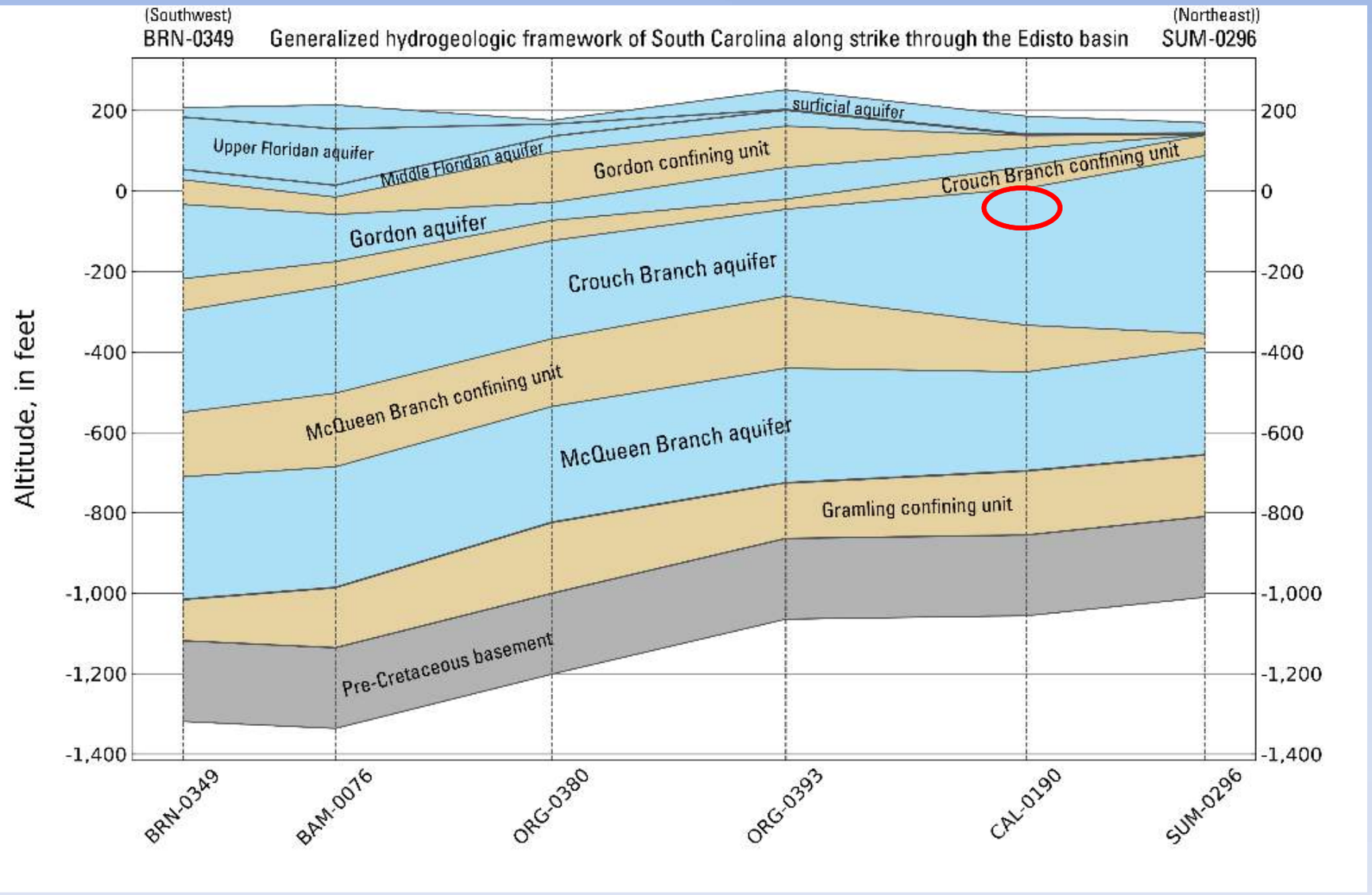
Hydrogeologic Framework





- Area of concern near Calhoun County where top of Crouch Branch aquifer is less deep than other parts of the Edisto River Basin

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