



SC DEPARTMENT *of*
**ENVIRONMENTAL
SERVICES**

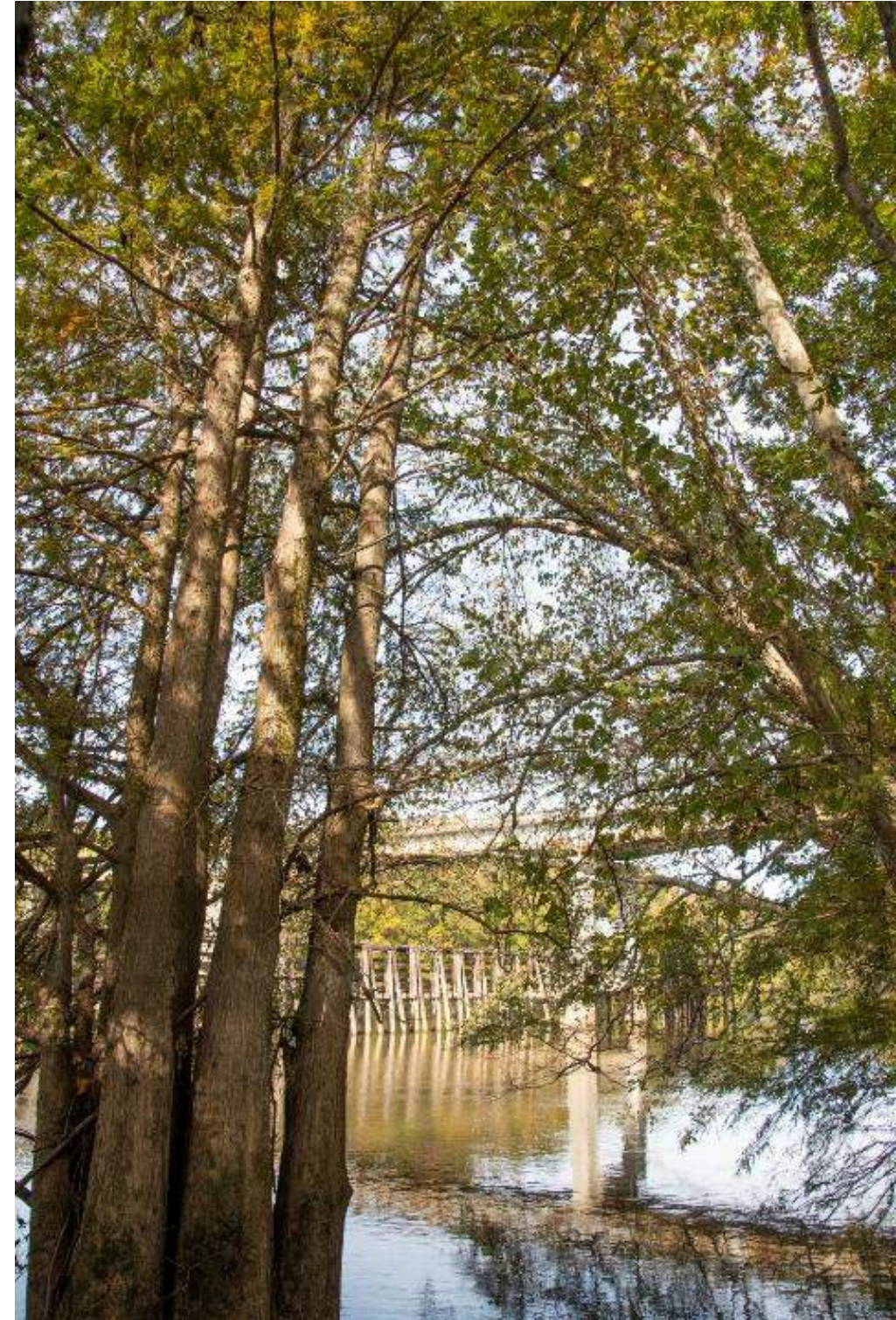
Water Demand and Projected Use in the Lower Savannah- Salkehatchie Basins

Brooke Czwartacki, Hydrology Section

Bureau of Water, South Carolina Department of
Environmental Services

January 9, 2025

Lower Savannah-Salkehatchie River Basin Council
Meeting #12

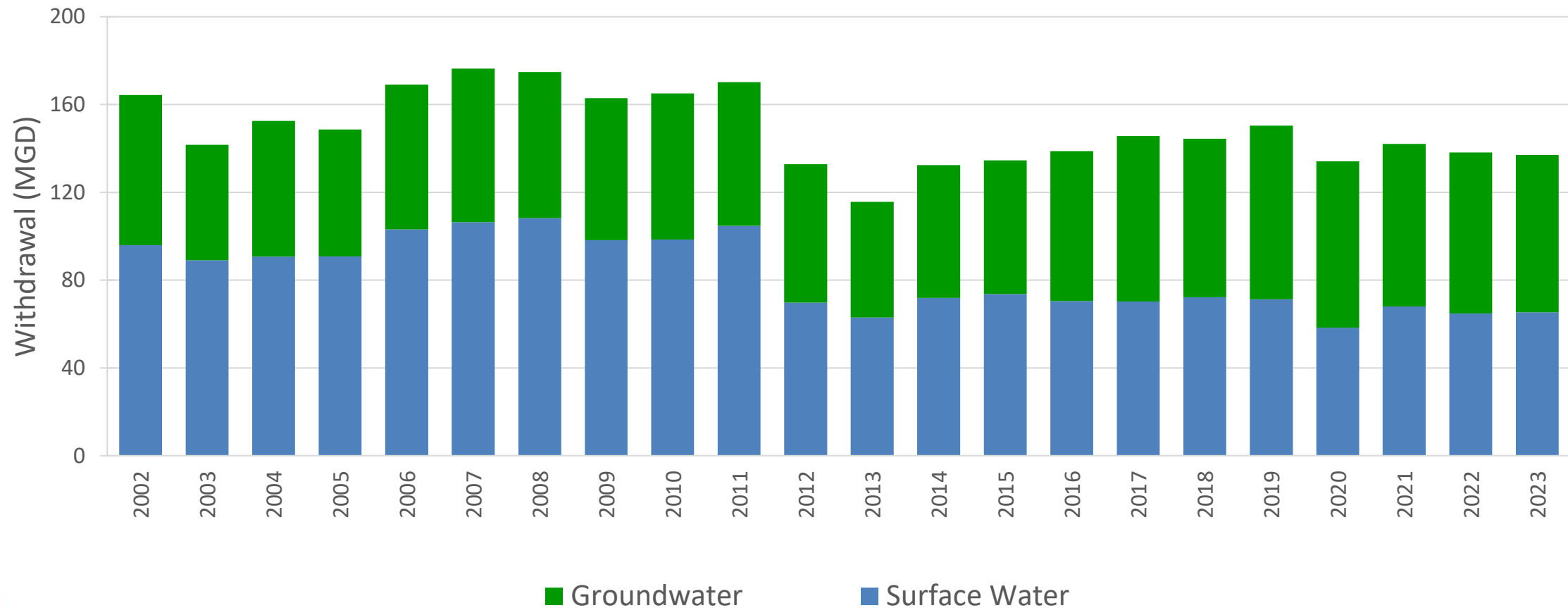


Reported Water Withdrawals (2002 – 2023)

Lower Savannah-Salkehatchie Basins



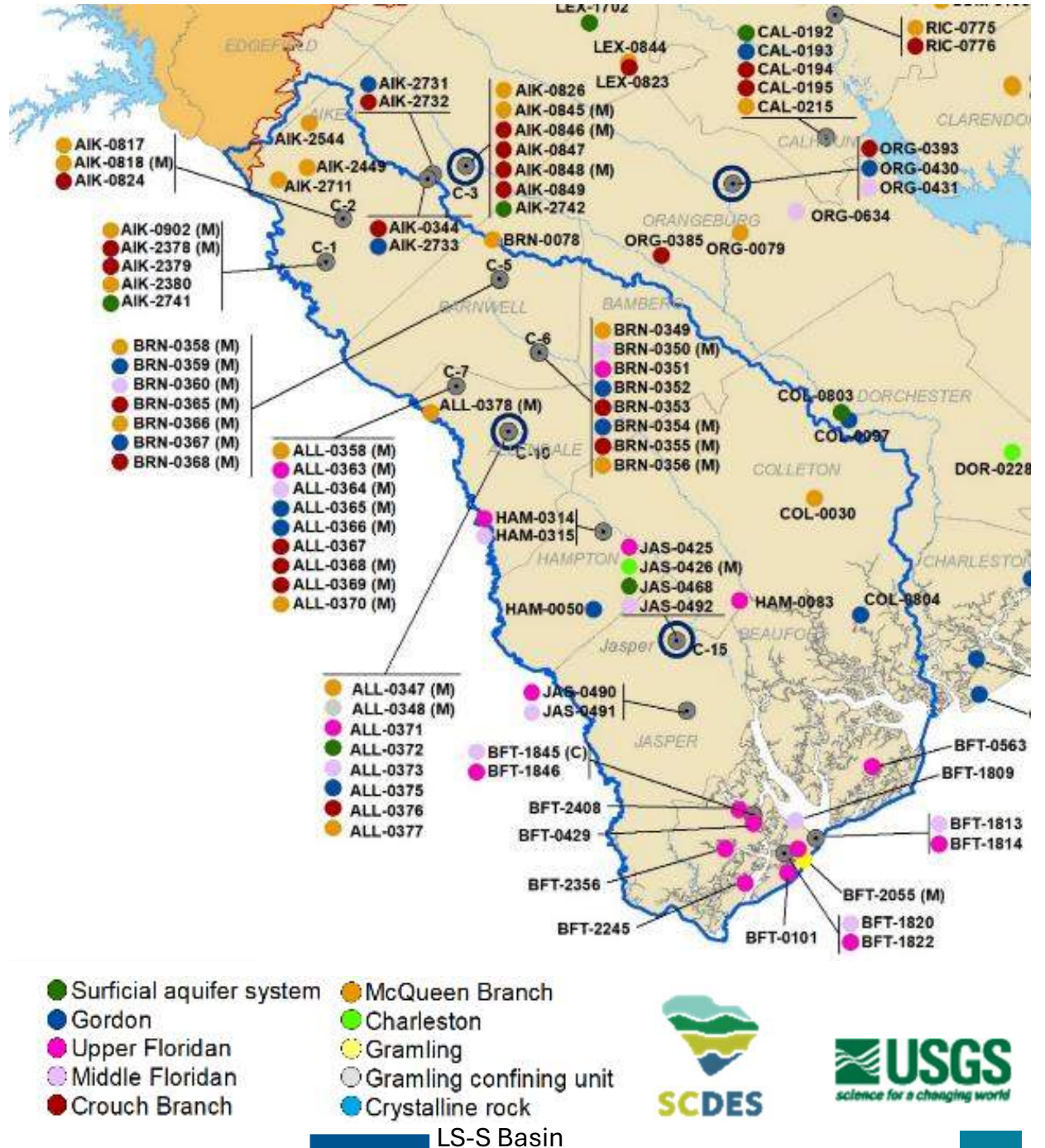
Total Reported Water Withdrawals (Excluding Energy)



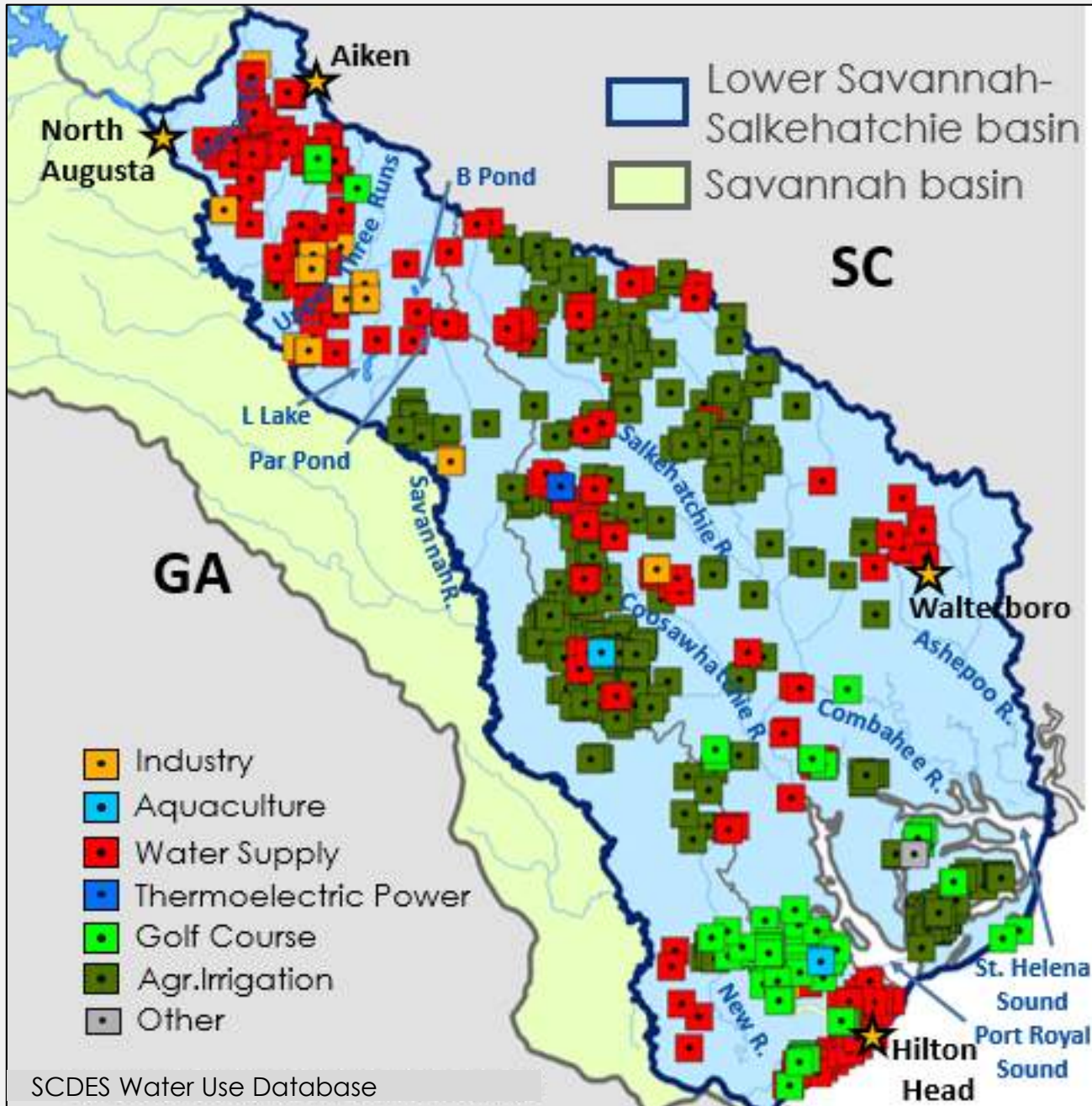
Groundwater Evaluation

- Historical and Current Reported Groundwater Use
- Groundwater Monitoring Network
- Potentiometric Surface Maps
- Lowcountry and Western Capacity Use Area Groundwater Evaluation Reports
- Groundwater Demand Projections

Estimate the potential for impacts to groundwater resources based on reported groundwater use, aquifer water-level trends, and demand projections



2023 Reported Water Withdrawals (Groundwater)



SCDES Water Use Database

Including Energy

SW : 68% 154 MGD
GW: 32% 72 MGD



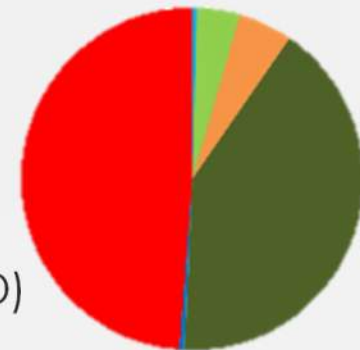
Excluding Energy

SW : 48% 65 MGD
GW: 52% 72 MGD

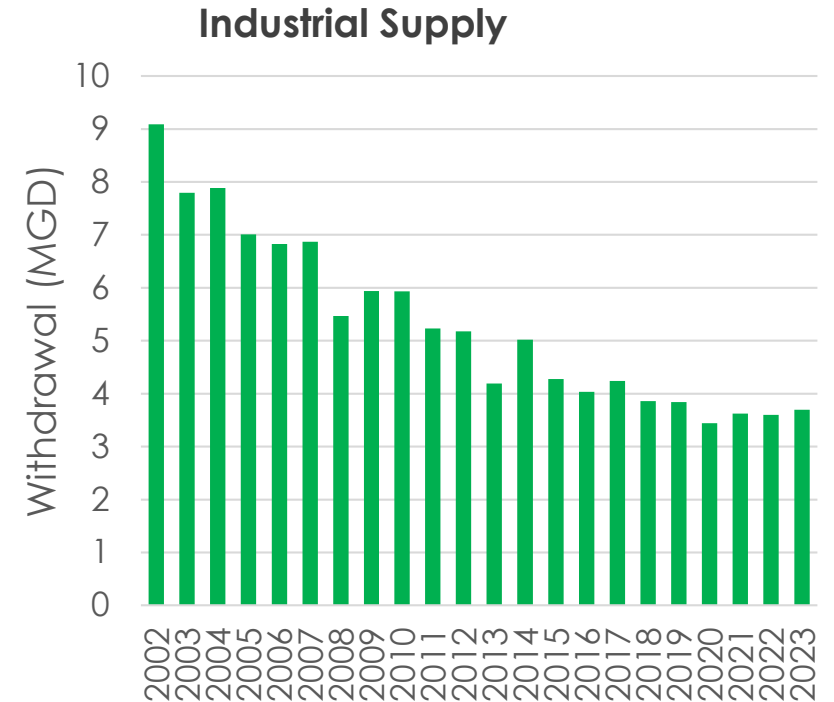
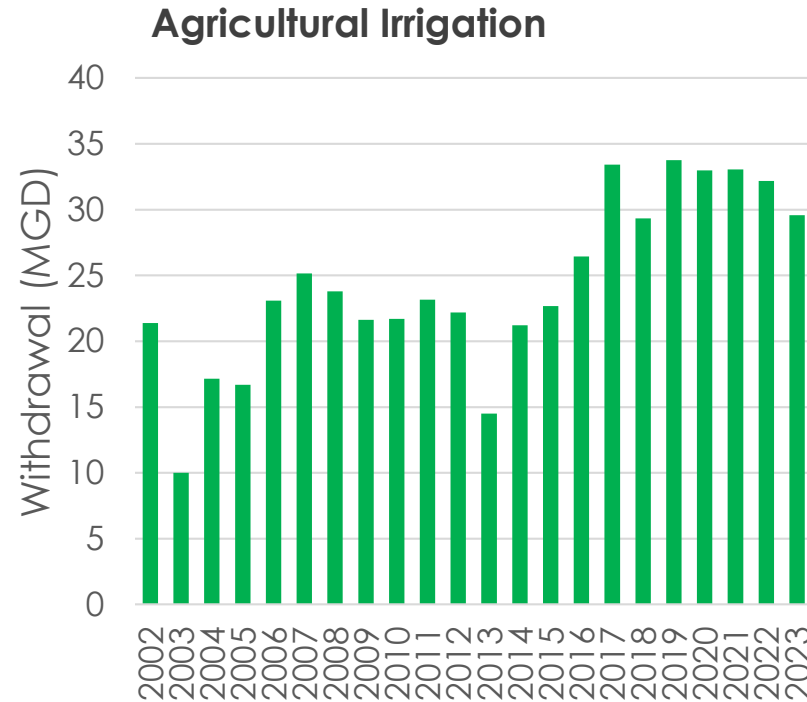
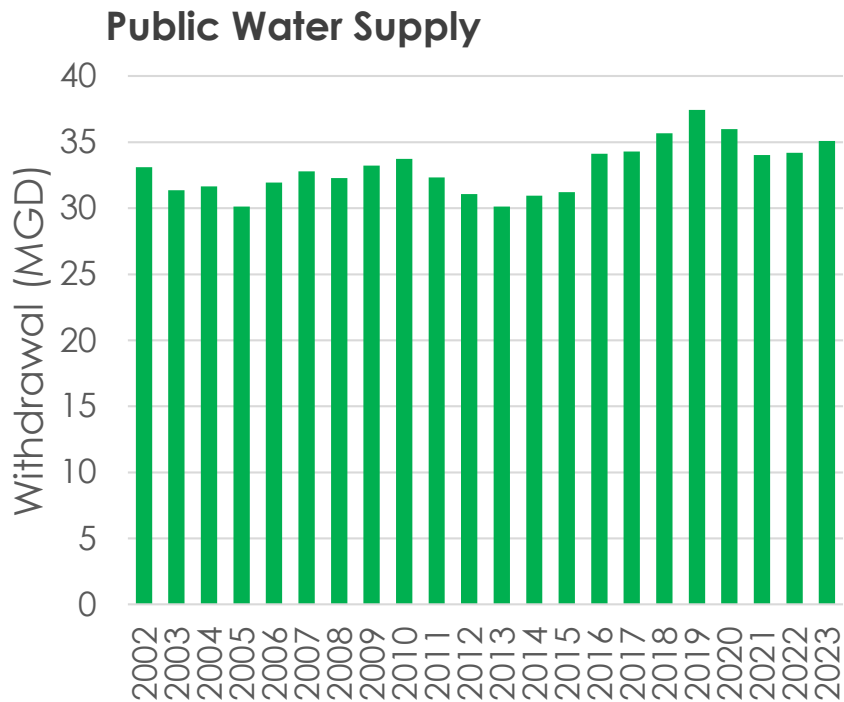


Groundwater Including Energy

- Water Supply (49%, 35 MGD)
- Agr. Irrigation (41%, 30 MGD)
- Industry (5%, 4 MGD)
- Golf Course (4%, 3 MGD)
- Thermoelectric Power (<1%, 0.3 MGD)
- Aquaculture (<1%, 0.3 MGD)
- Other (<1%, 0.07 MGD)



Reported Groundwater Withdrawal Lower Savannah-Salkehatchie Basins



*note the y-axis of Industrial Supply



Largest Groundwater Users

Permit Number	Category	County	Owner	Aquifers	2019	2020	2021	2022	2023	*5-year average
07WS016, 52, 53, 54	WS	Beaufort	SIPSD	Upper Floridan, Middle Floridan, Gramling	2460.54	2442.68	2522.62	1823.98	2493.66	2348.70
02WS002	WS	Aiken	City of Aiken	Crouch Branch, Crouch Branch + McQueen Branch	2180.48	1937.94	1858.98	1890.51	1973.93	1968.37
07WS018	WS	Beaufort	Hilton Head PSD 1	Middle Floridan	1888.30	1831.45	1783.24	1849.14	1859.53	1842.33
03IR010	IR	Allendale	Oswald JCO Farms	Crouch Branch	1830.00	1803.90	1858.00	1833.30	1691.50	1803.34
15IR012	IR	Colleton	Williams Farms	Upper Floridan, Middle Floridan, Gordon	1199.00	1066.00	974.00	495.00	738.00	894.40
03IR006	IR	Allendale	Sharp & Sharp Feed	Gordon, Crouch Branch	769.00	767.00	773.00	906.00	858.00	814.60
25IR065	IR	Hampton	Youmans Farms	Upper Floridan, Upper Floridan and Middle Floridan	804.31	683.46	613.08	665.48	515.58	656.38
15WS001	WS	Colleton	City of Walterboro	Gordon, Crouch Branch, Charleston	597.43	623.05	635.83	662.93	638.47	631.54
02WS008	WS	Aiken	Beech Island Rural	Crouch Branch, Crouch Branch + McQueen Branch, McQueen Branch	611.90	553.37	605.77	634.75	620.37	605.23
03IN001	IN	Allendale	Archroma Martin Plant	Crouch Branch	677.39	636.68	606.74	515.48	538.86	595.03
07WS014	WS	Beaufort	Hilton Head PSD 1	Upper Floridan	620.12	597.70	602.70	601.56	532.39	590.90
06WS003	WS	Barnwell	City of Barnwell	Gordon	623.14	611.46	554.69	546.99	401.47	547.55
02WS005	WS	Aiken	Breezy Hill	Crouch Branch, McQueen Branch	494.28	470.00	473.79	496.66	492.11	485.37
05IR059	IR	Bamberg	Old Salem Dairy	Middle Floridan + Gordon, Gordon + Crouch Branch	457.50	447.00	440.80	439.50	444.00	445.76

* 5-Year average MGY 2019-2023

2023 Reported Groundwater Use by Aquifer in the Lower Savannah-Salkehatchie Basin



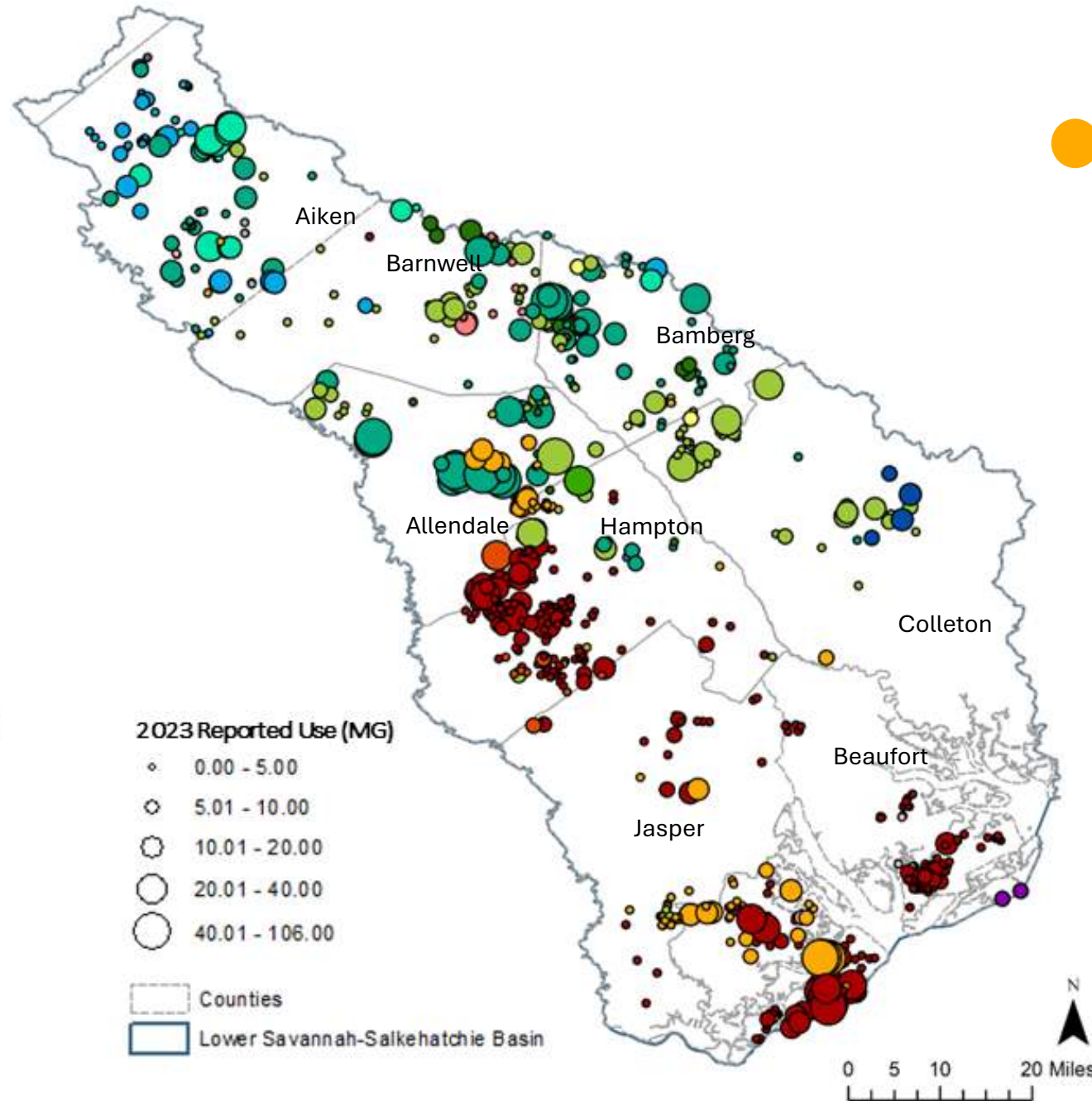
- Aquifer(s)**
- Surficial
 - Upper Three Runs
 - Upper Floridan
 - Upper Floridan-Middle Floridan
 - Middle Floridan
 - Middle Floridan-Gordon
 - Gordon
 - Floridan
 - Gordon-Crouch Branch
 - Crouch Branch
 - Crouch Branch-McQueen Branch
 - McQueen Branch
 - Charleston
 - Gramling
 - Bedrock
 - Unavailable

2023 Reported Use (MG)

- 0.00 - 5.00
- 5.01 - 10.00
- 10.01 - 20.00
- 20.01 - 40.00
- 40.01 - 106.00

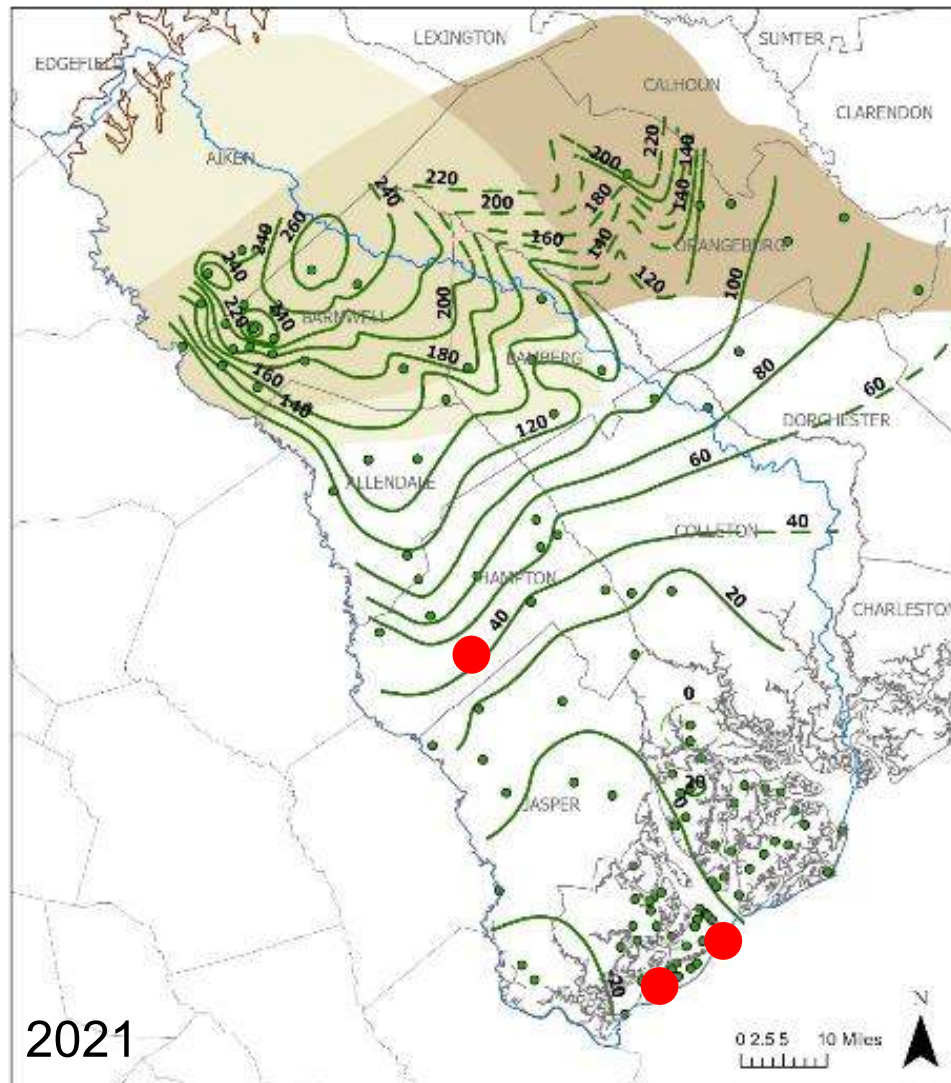
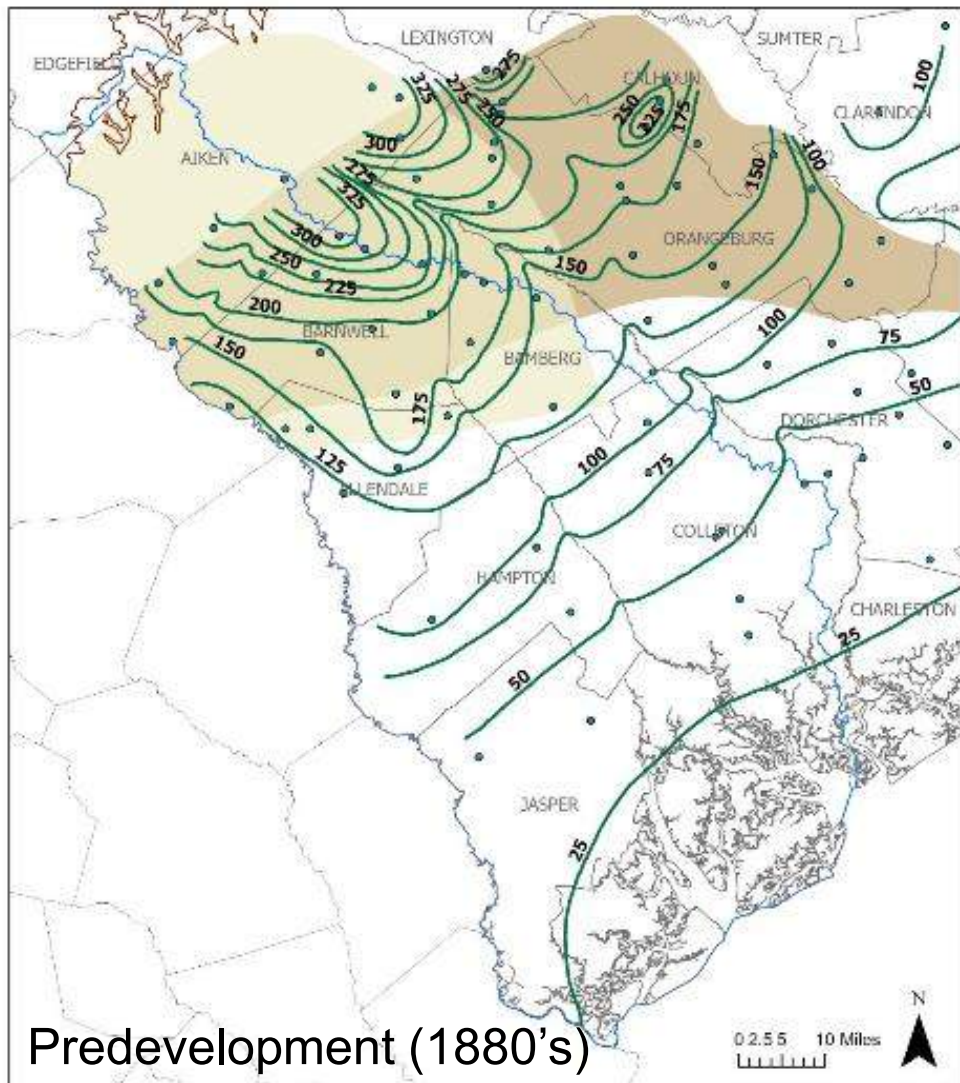
- ▭ Counties
- ▭ Lower Savannah-Salkehatchie Basin

- **Upper Floridan-Middle Floridan**
Beaufort County (WS)
Hampton County (Ag Irr.)
- **Gordon**
Colleton County (Ag Irr.)
- **Crouch Branch**
Allendale County (Ag Irr., Industry)
- **Crouch Branch and McQueen Branch**
Aiken County (WS)
- **Gramling**
Beaufort County (WS)





Upper and Middle Floridan Aquifer



- Upper and Middle Floridan aquifers mapped together due to minor head differences.
- Primarily used for agriculture and water supply; golf course irrigation secondary.
- Pumping centers at Hilton Head Is. and Savannah, GA have shifted gradient from SE to SW. A ten-foot gradient exists across HHI.
- Water level declines since predevelopment between 25 and 45 feet at the coast, saltwater intrusion at Hilton Head is an ongoing problem.

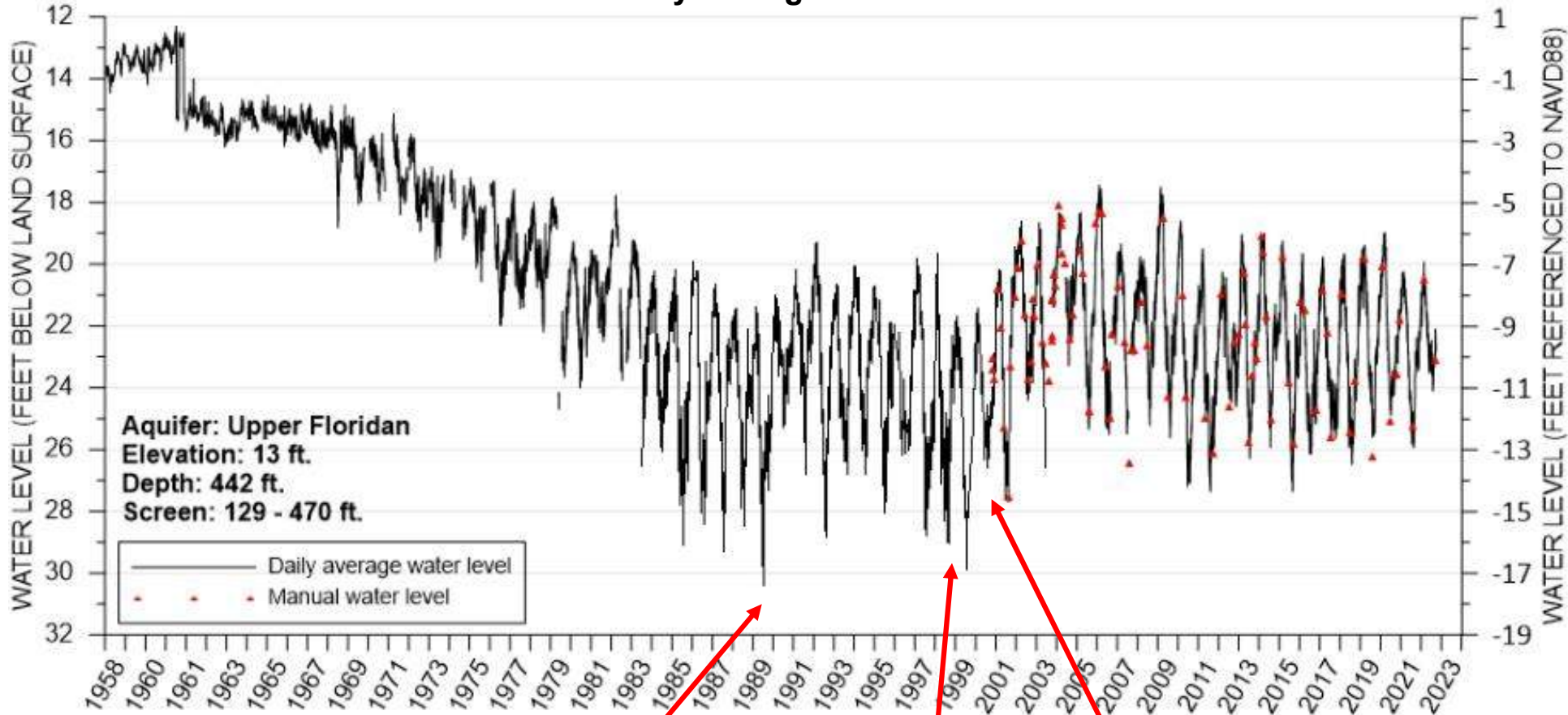
ext_upper_floridan_rech
ext_middle_floridan_rech
FloridanPreDev (feet, in elevation)
wellsPreDev

ext_upper_floridan_rech
ext_middle_floridan_rech
Floridan2021 (feet, in elevation)
Wells 2021

Upper Floridan Aquifer Hilton Head Island and Savannah, GA



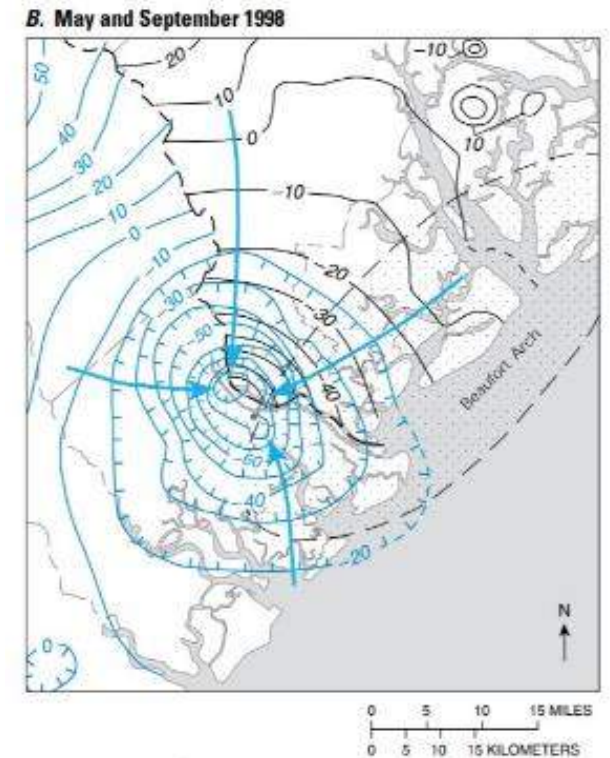
BFT-101 Daily Average Water Levels



1990 GW @
14.5 MGD

1998 GW
Capped at
9.7 MGD

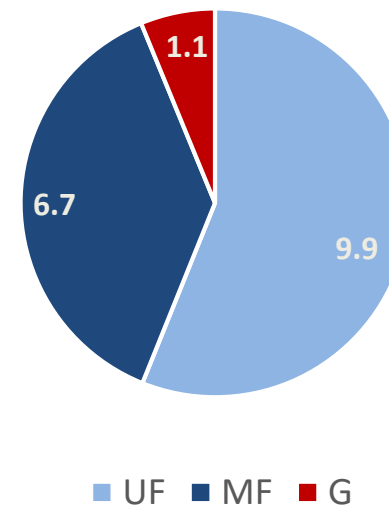
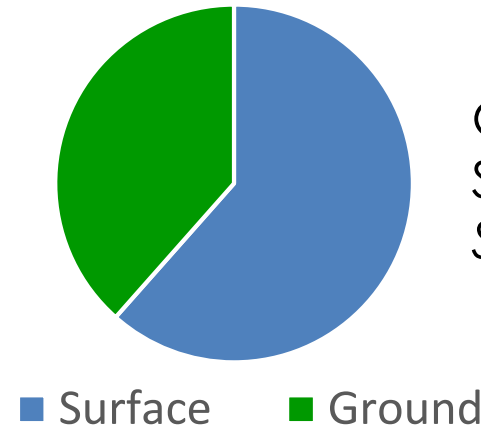
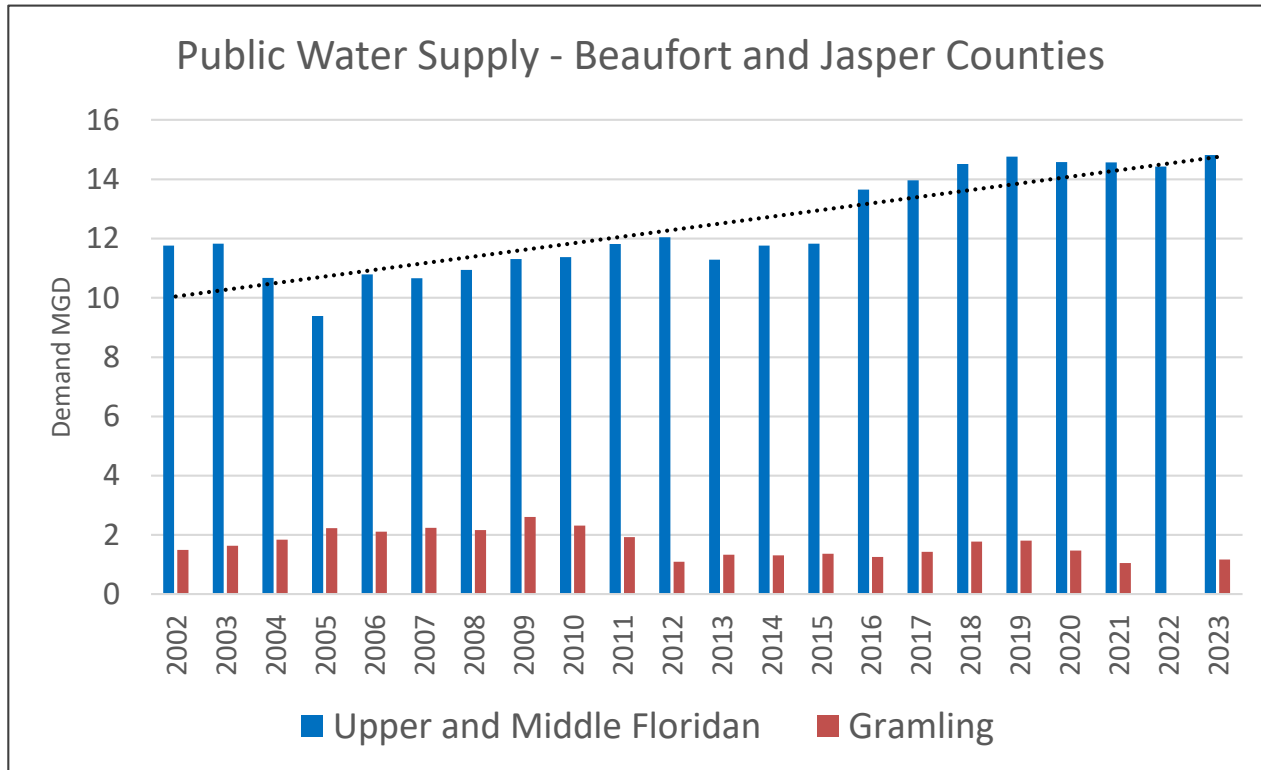
1999 HHP
Supplementing
with SW



Reversal of flow and
loss of head drives
saltwater intrusion



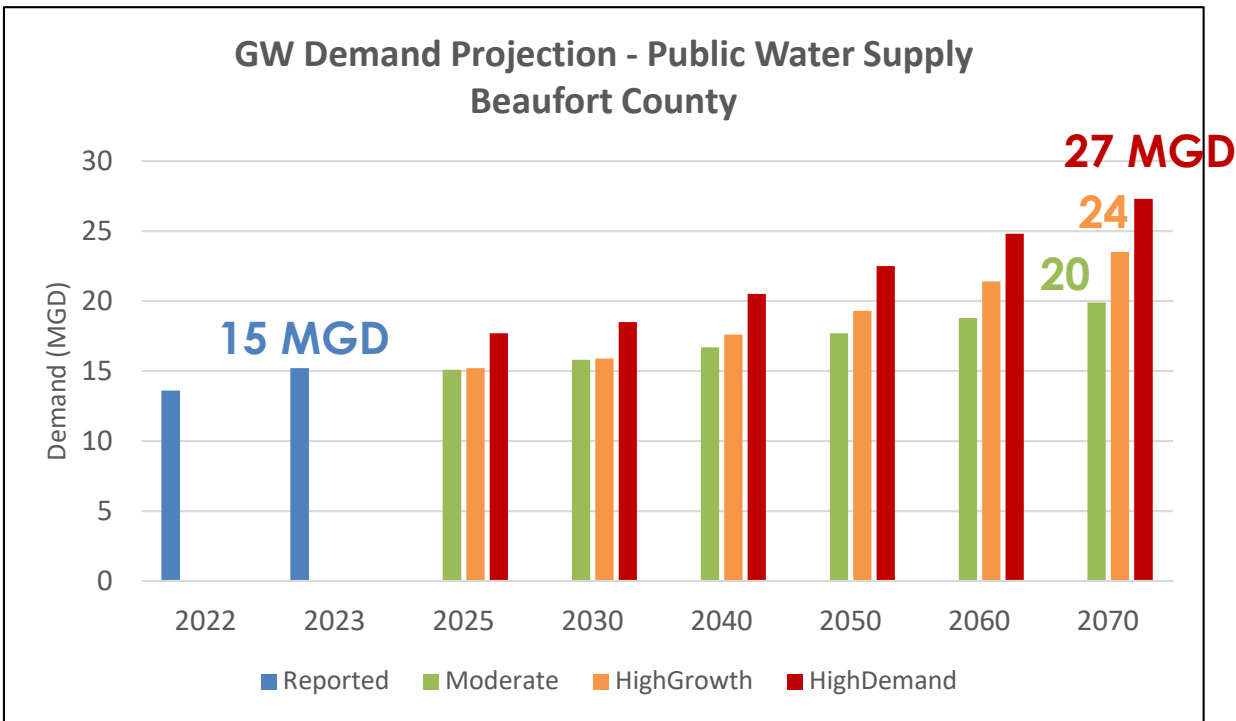
Public Water Supply Beaufort and Jasper Counties



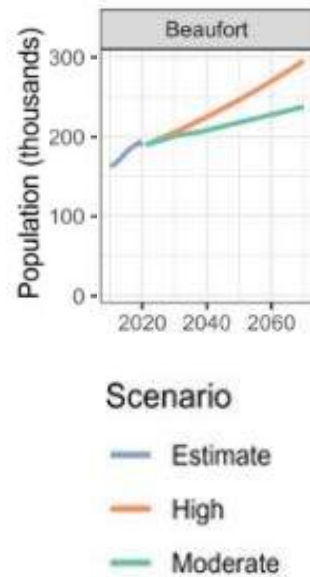
**Supply side management is utilized to meet current demand:
conjunctive surface water use , aquifer storage and recovery, reverse osmosis**

*Percentages and use based on 5-Year average MGD, UF aquifer use on HHI is capped at 9.7 MGD

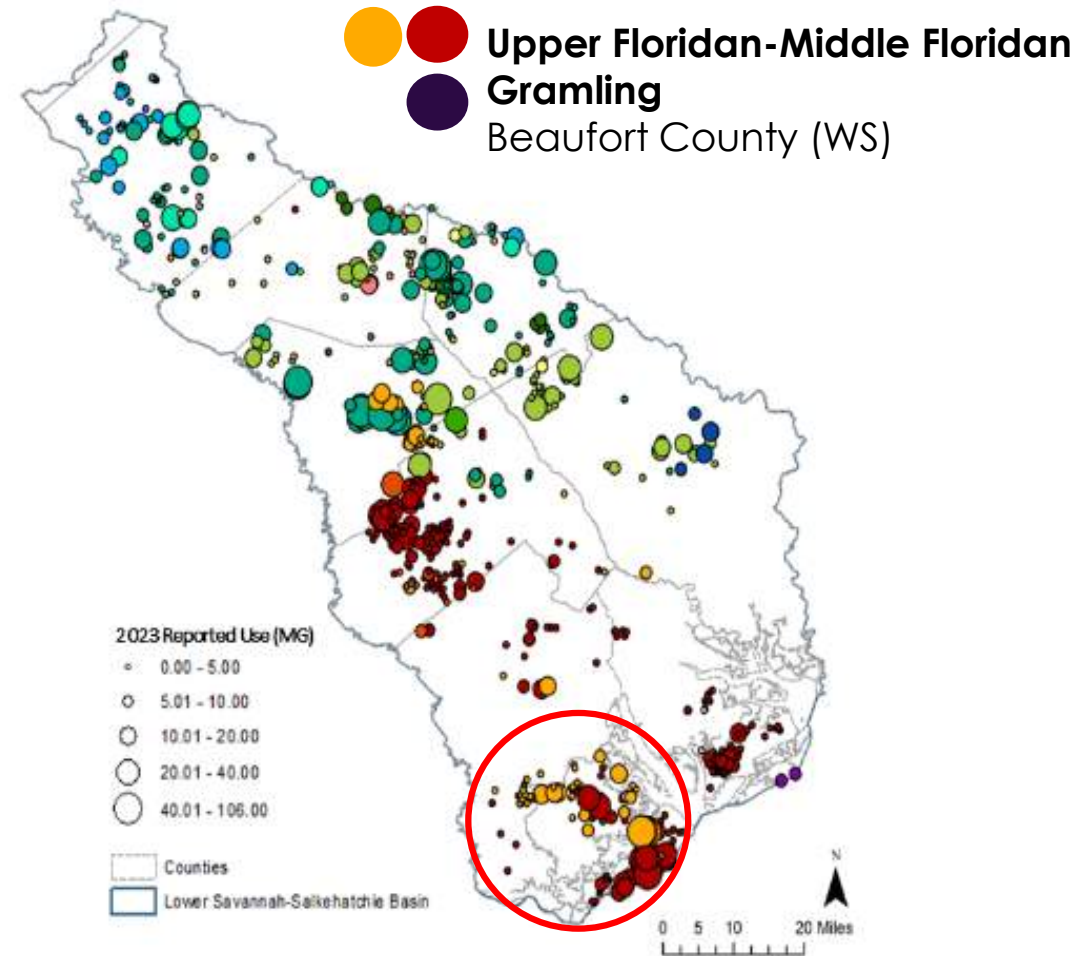
Groundwater Projections – Public Water Supply Beaufort County



Moderate Demand Scenario: 33% Increase
High Growth Scenario: 60% Increase
High Demand Scenario: 80% Increase



2023 Reported Groundwater Use by Aquifer in the Lower Savannah-Salkehatchie Basin

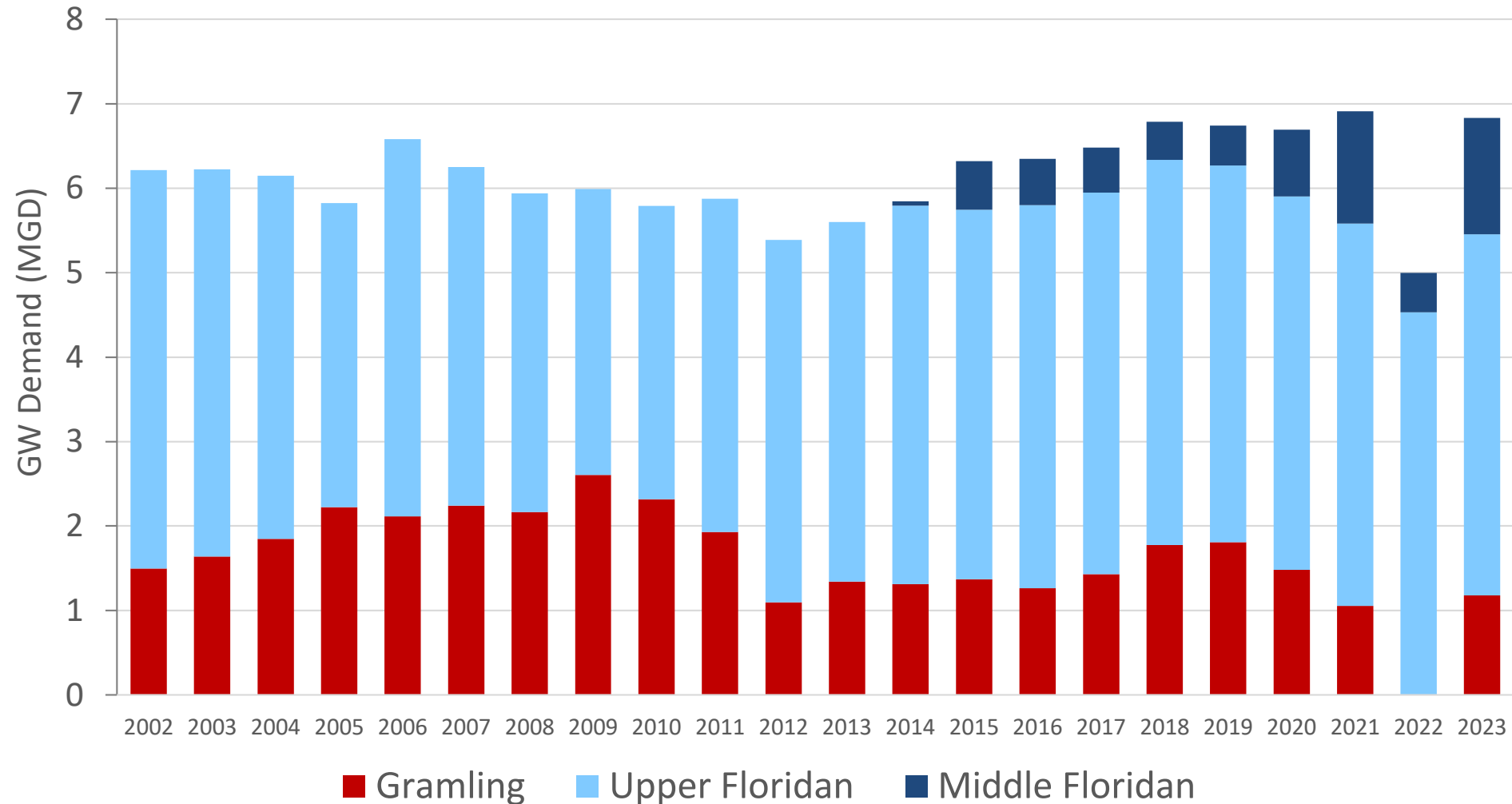


Groundwater Withdrawals For Public Supply

Hilton Head Island, Beaufort County



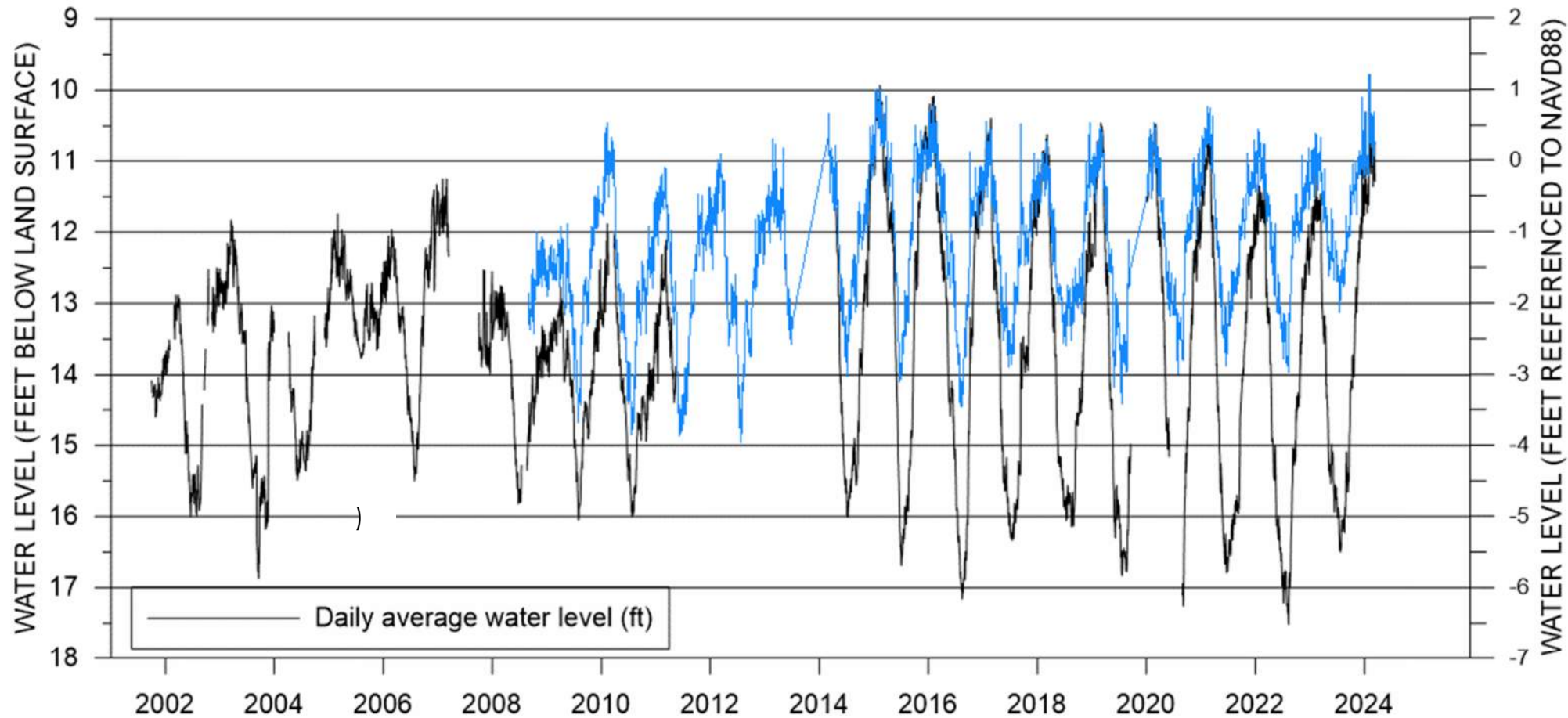
Groundwater Use by Aquifer - Public Water Supply (South Island PSD)



Upper and Middle Floridan Aquifer Hilton Head Island, Beaufort County



BFT-1813 and BFT-1814 Daily Average and Manual Water Levels



Well: BFT-1813
Aquifer: Middle Floridan
Elevation: 11 ft.
Depth: 600 ft.
Screen: 280 - 600 ft.

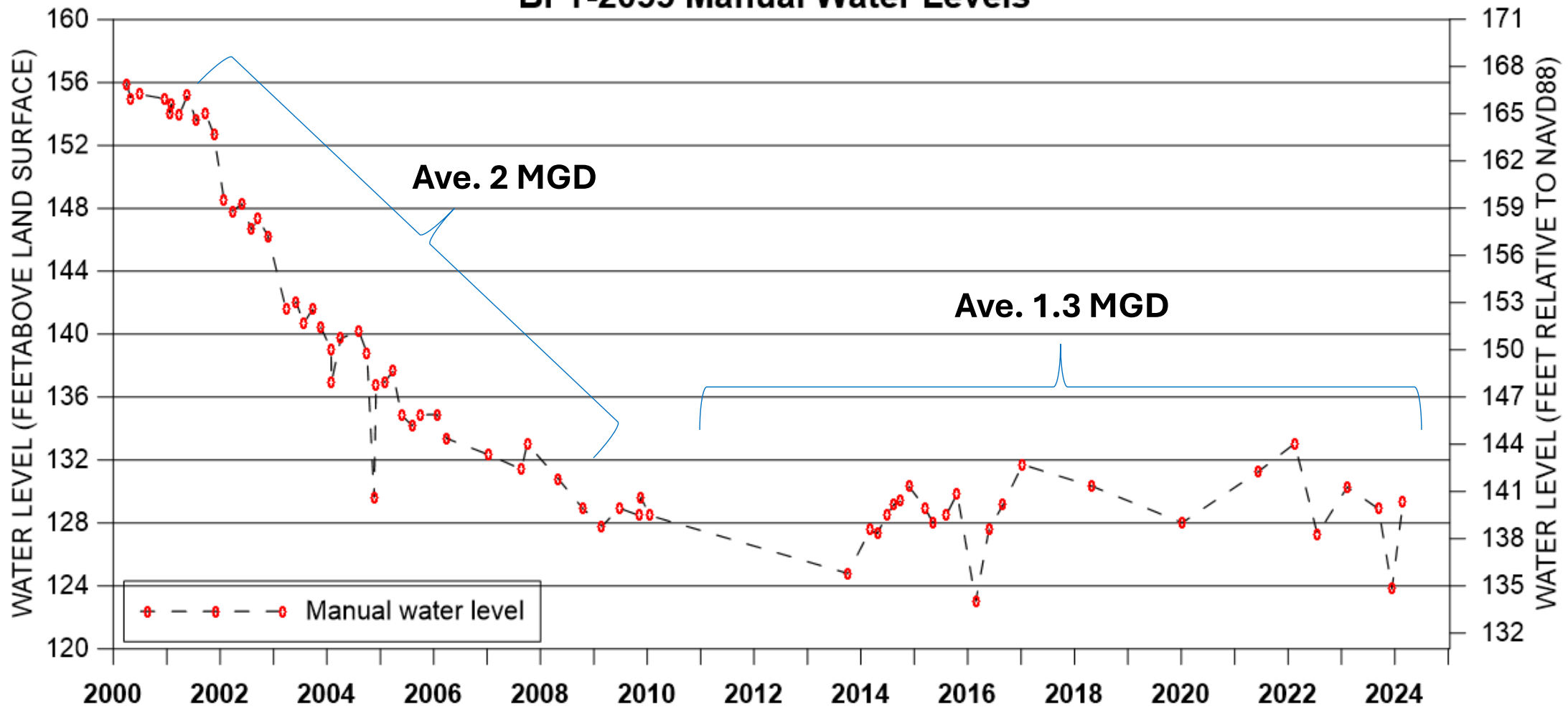
Well: BFT-1814
Aquifer: Upper Floridan
Elevation: 11 ft.
Depth: 210 ft.
Screen: 120 - 210 ft.

Gramling Aquifer

Hilton Head Island, Beaufort County



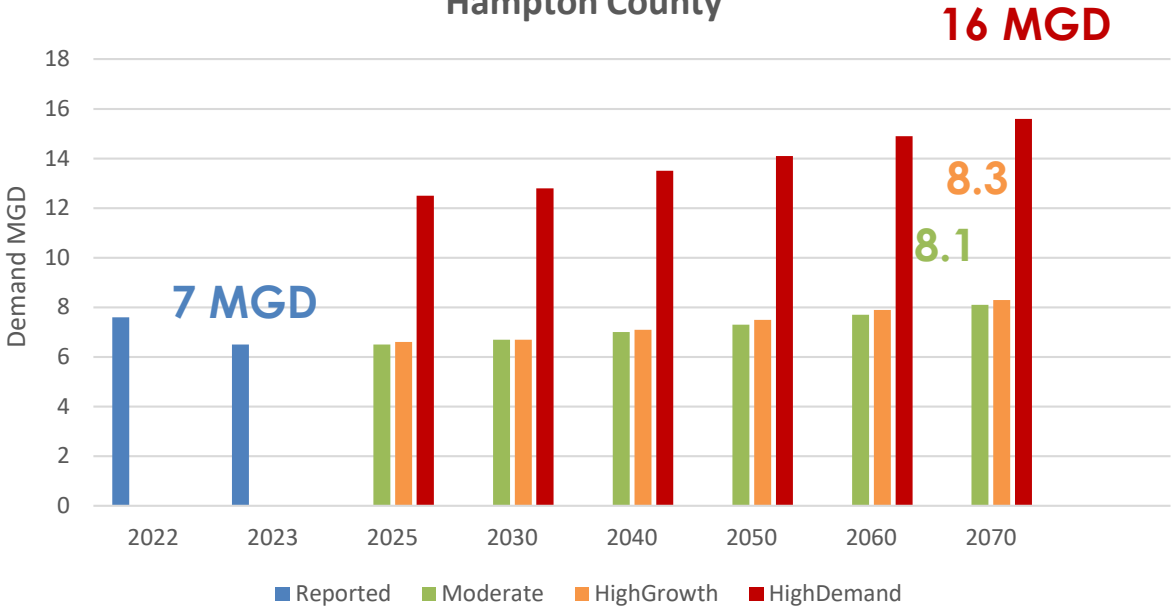
BFT-2055 Manual Water Levels



Aquifer: Gramling
Elevation: 11 ft.
Depth: 3708 ft.
Screen: 2782-3688 ft.

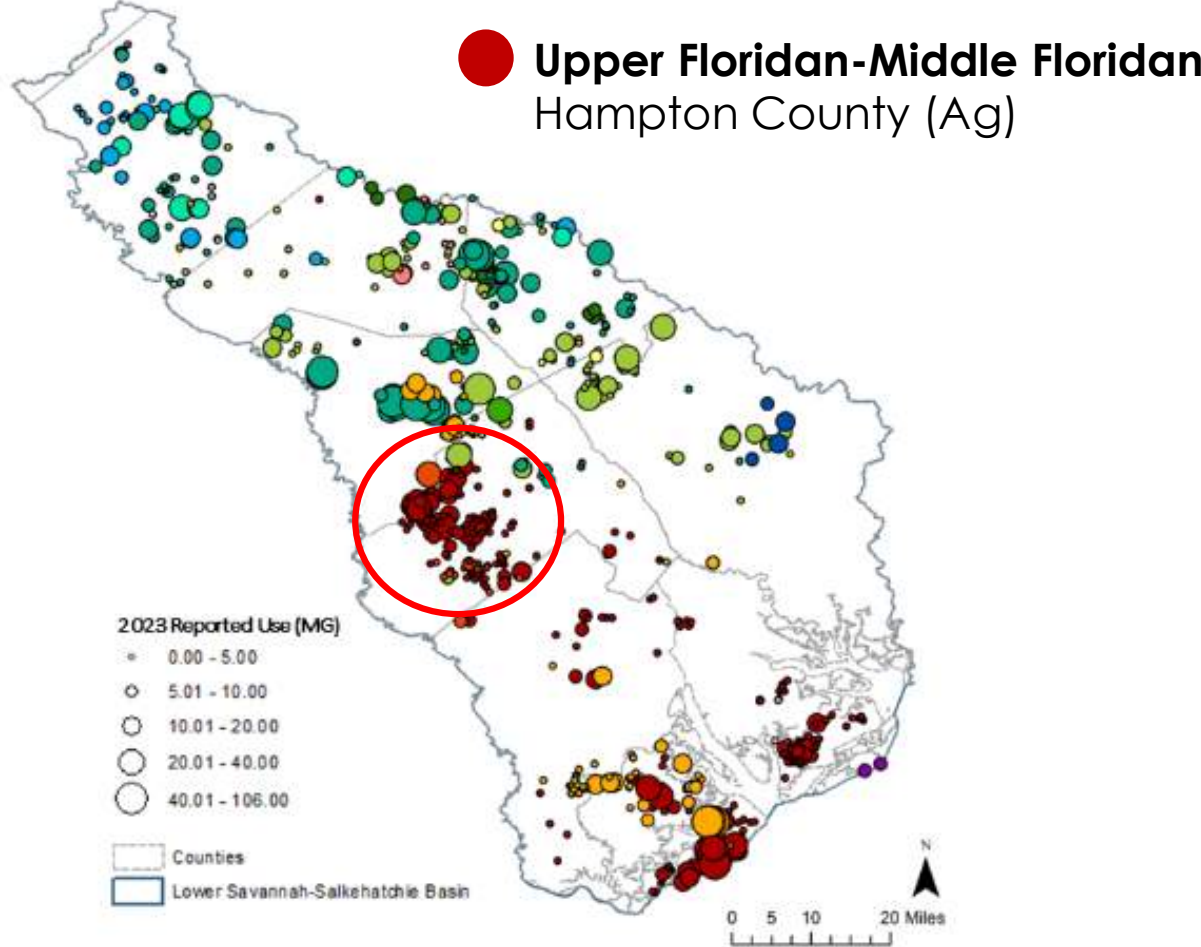
Groundwater Projections – Agricultural Irrigation Hampton County

GW Demand Projection - Agricultural Irrigation
Hampton County

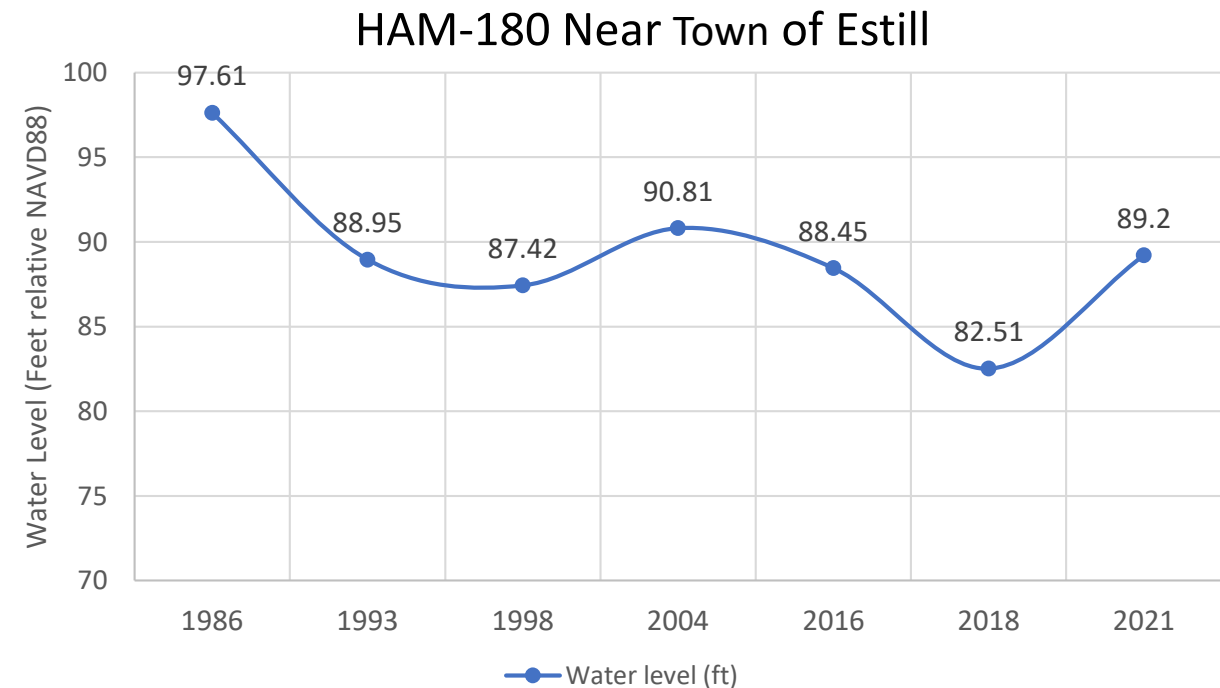
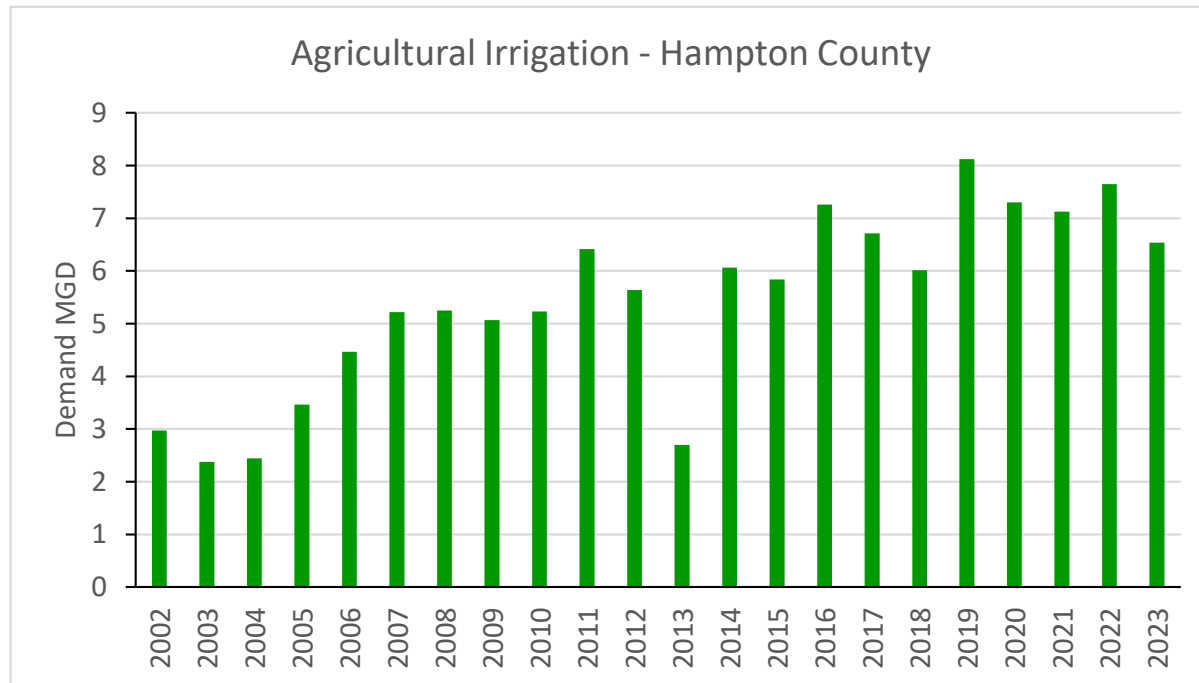


Moderate Demand Scenario: 16% Increase
High Growth Scenario: 19% Increase
High Demand Scenario: 128% Increase

2023 Reported Groundwater Use by Aquifer in the Lower Savannah-Salkehatchie Basin



Agricultural Water Use Upper and Middle Floridan Aquifers Hampton County



Upper and Middle Floridan are the primary aquifers

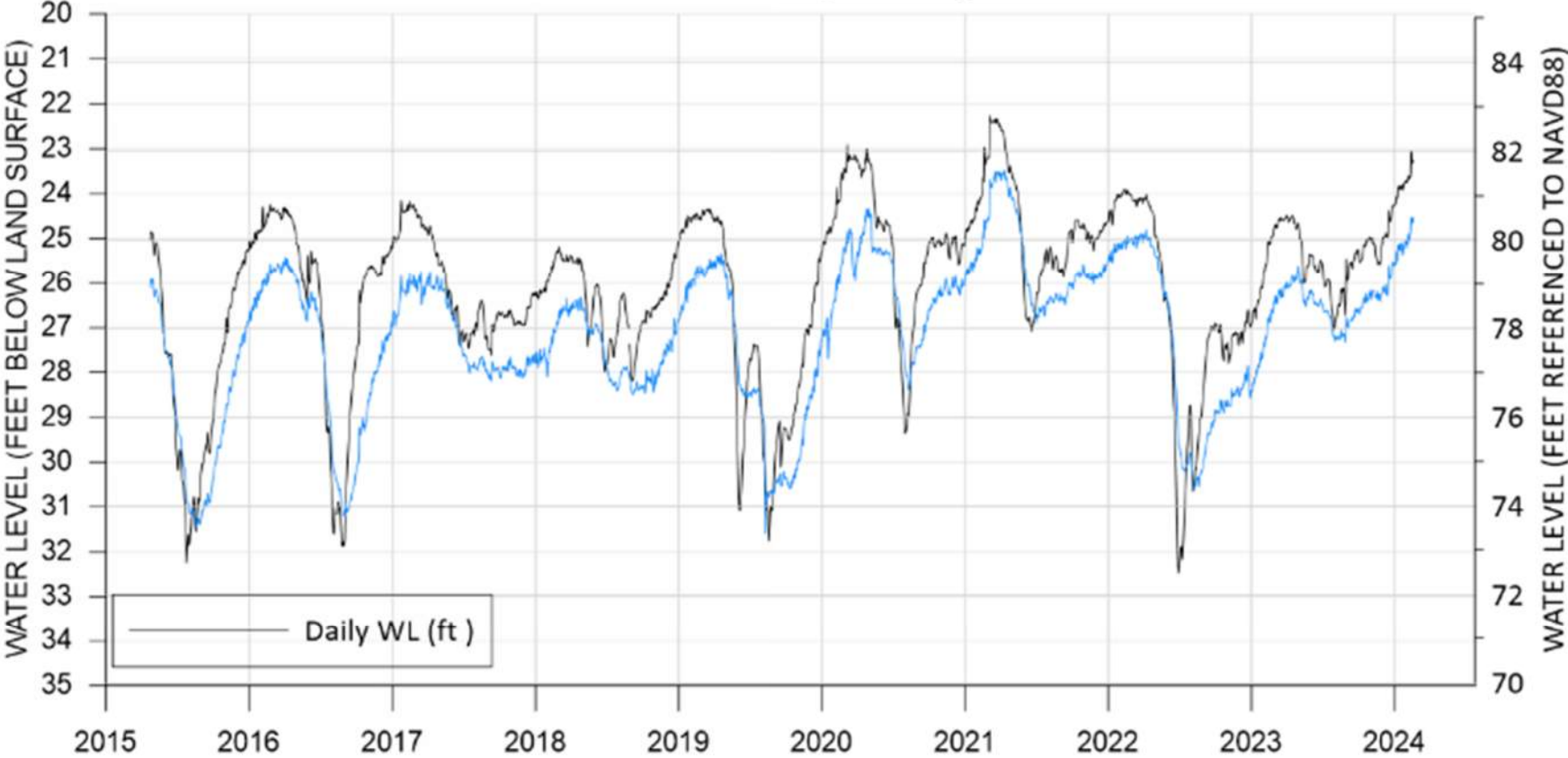
Aquifer: Middle Floridan
Well depth: 299 FT
Elevation: 131 FT



Upper and Middle Floridan Aquifer Lake Warren State Park, Hampton County



HAM-0314 and HAM-0315 Daily Average Water Levels

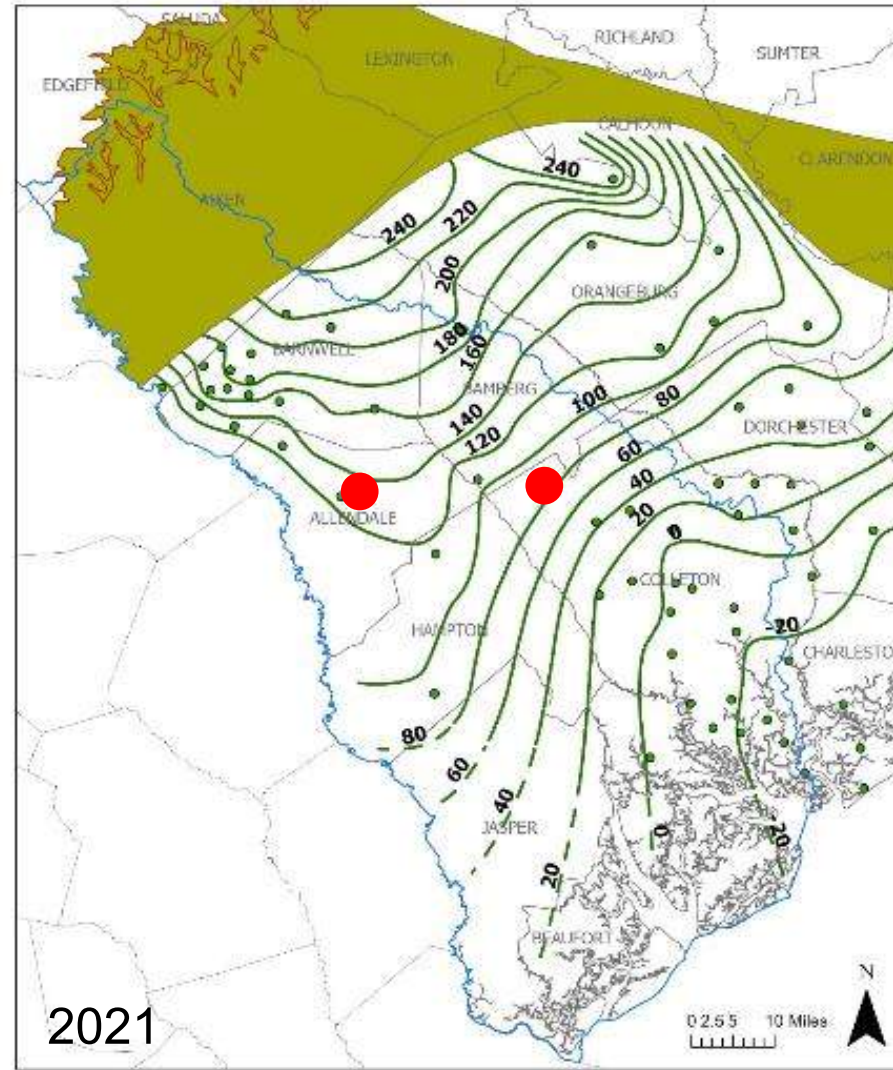
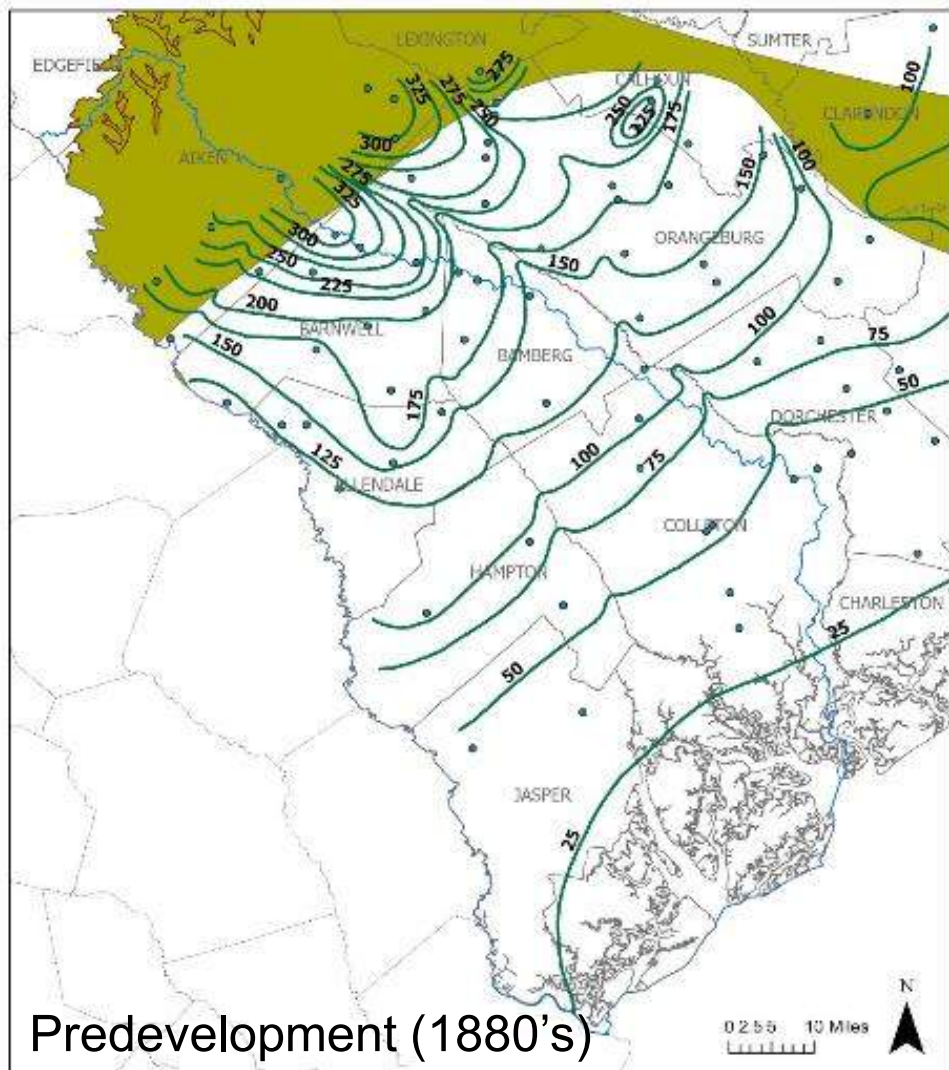


HAM-314
 Aquifer: Upper Floridan
 Elevation: 105 ft
 Depth: 122 ft
 Screen: 88-122 ft

HAM-315
 Aquifer: Middle Floridan
 Elevation: 105 ft
 Depth: 568 ft
 Screen: 200-568 ft



Gordon Aquifer

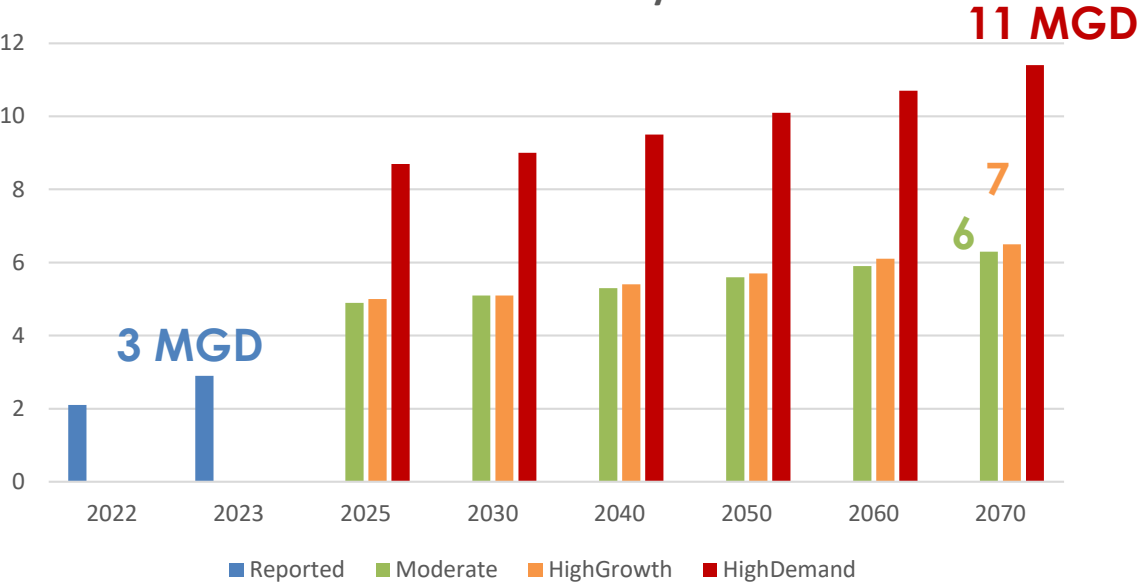


- Gordon Aquifer was previously mapped with the Floridan Aquifer.
- Primarily used for agriculture; water supply, and industry secondary.
- Domestic, rural public supply, fire station use in Colleton County trends brackish towards coast.
- Water level declines since predevelopment between 25 and 45 feet at the coast due to out of basin demand.

Groundwater Projections – Agricultural Irrigation

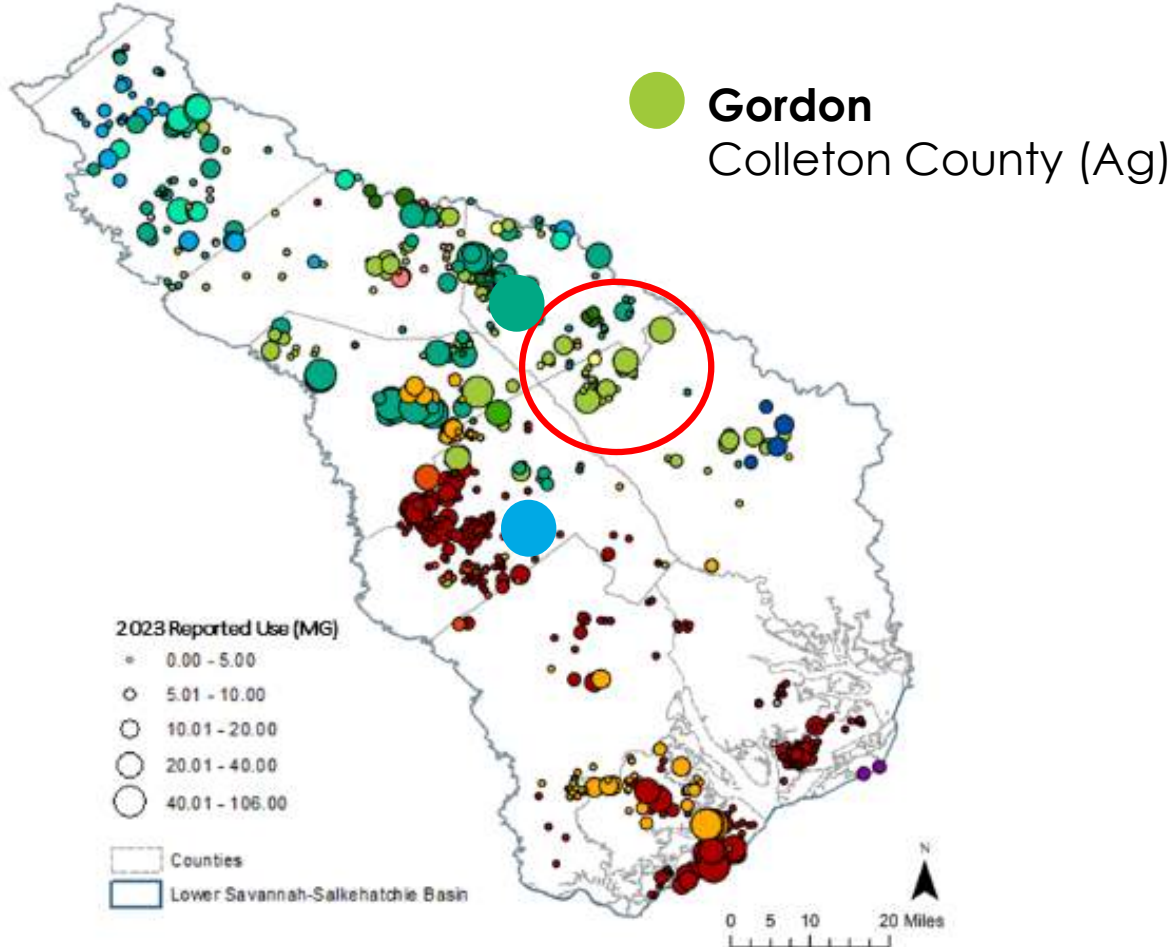
Colleton County

GW Demand Projection - Agricultural Irrigation
Colleton County



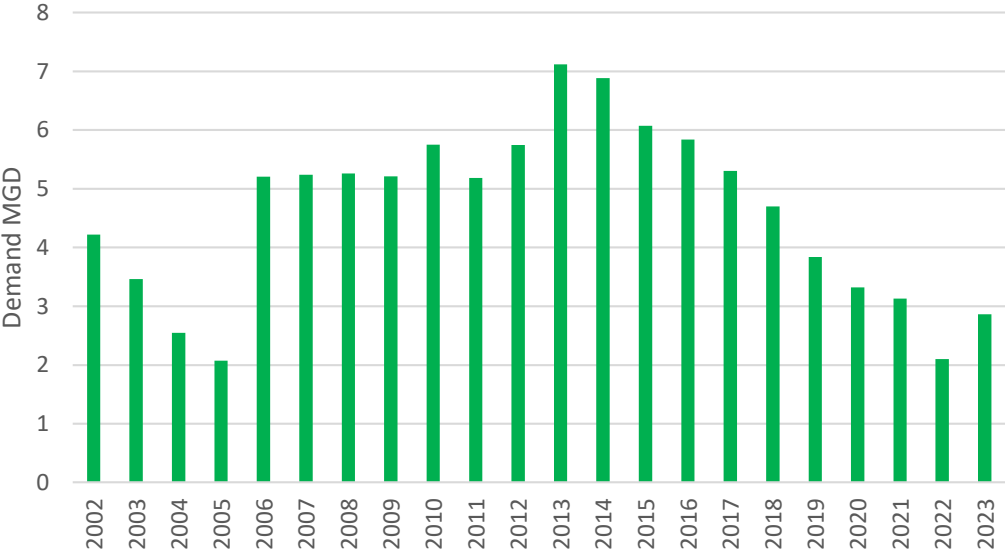
Moderate Demand Scenario: 100% Increase
High Growth Scenario: 133% Increase
High Demand Scenario: 267% Increase

2023 Reported Groundwater Use by Aquifer in the Lower Savannah-Salkehatchie Basin

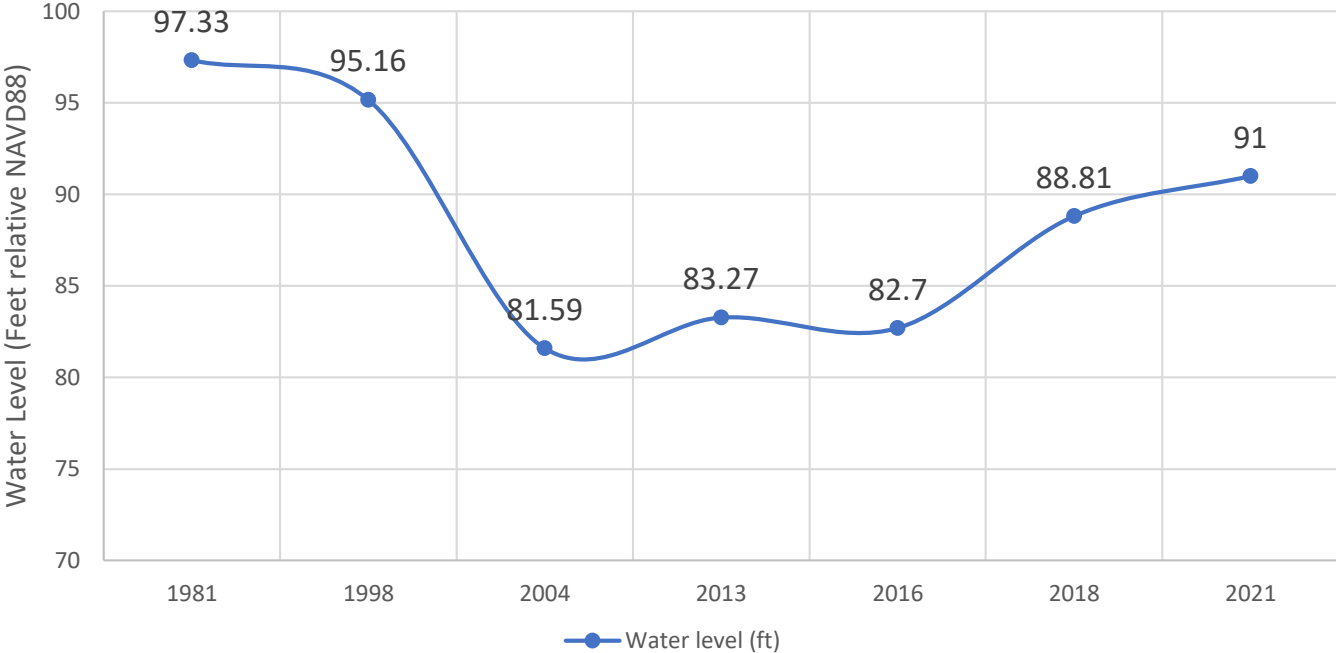


Agricultural Water Use Gordon Aquifer Colleton County

Agricultural Irrigation - Colleton County



COL-0232 Near Town of Lodge

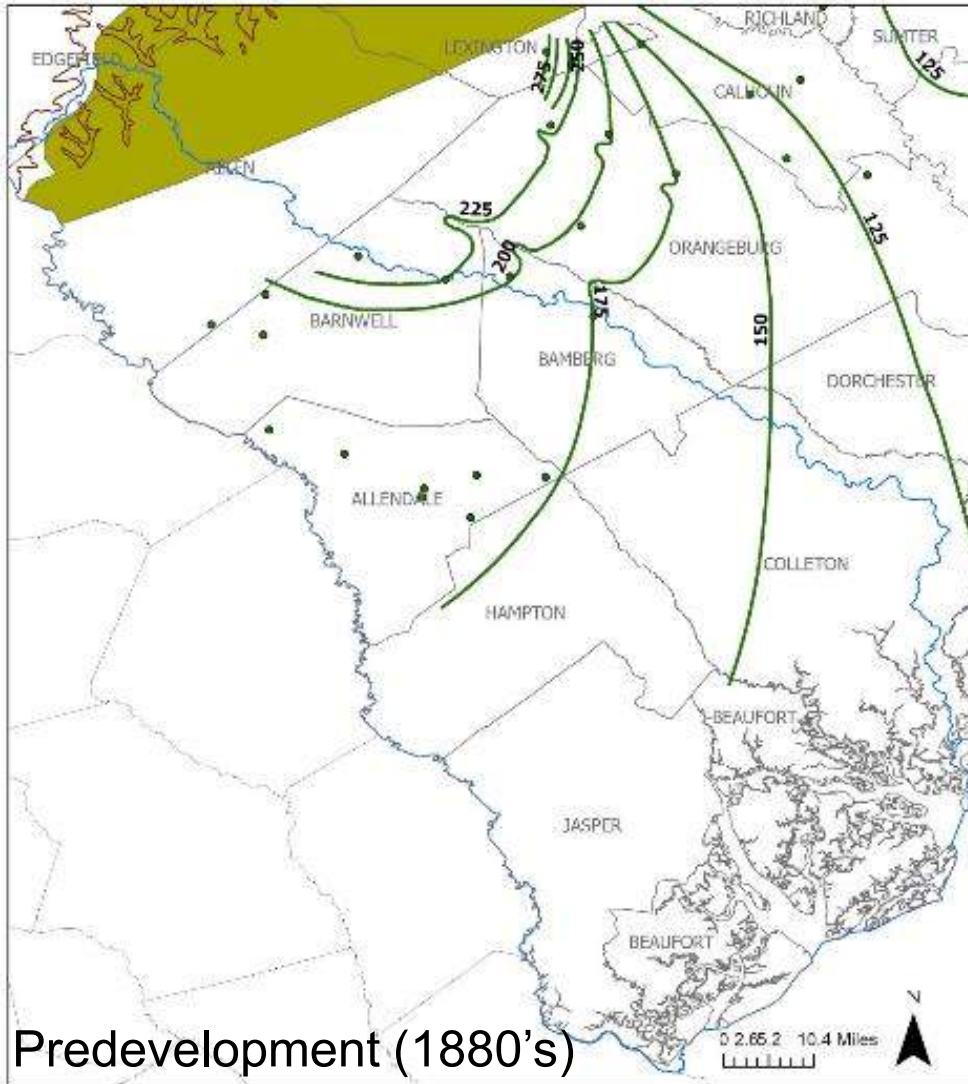


Gordon is the primary aquifer (small portion Floridan)
Crouch Branch is a small portion

Aquifer: Gordon
Well depth: 510 FT
Elevation: 110 FT

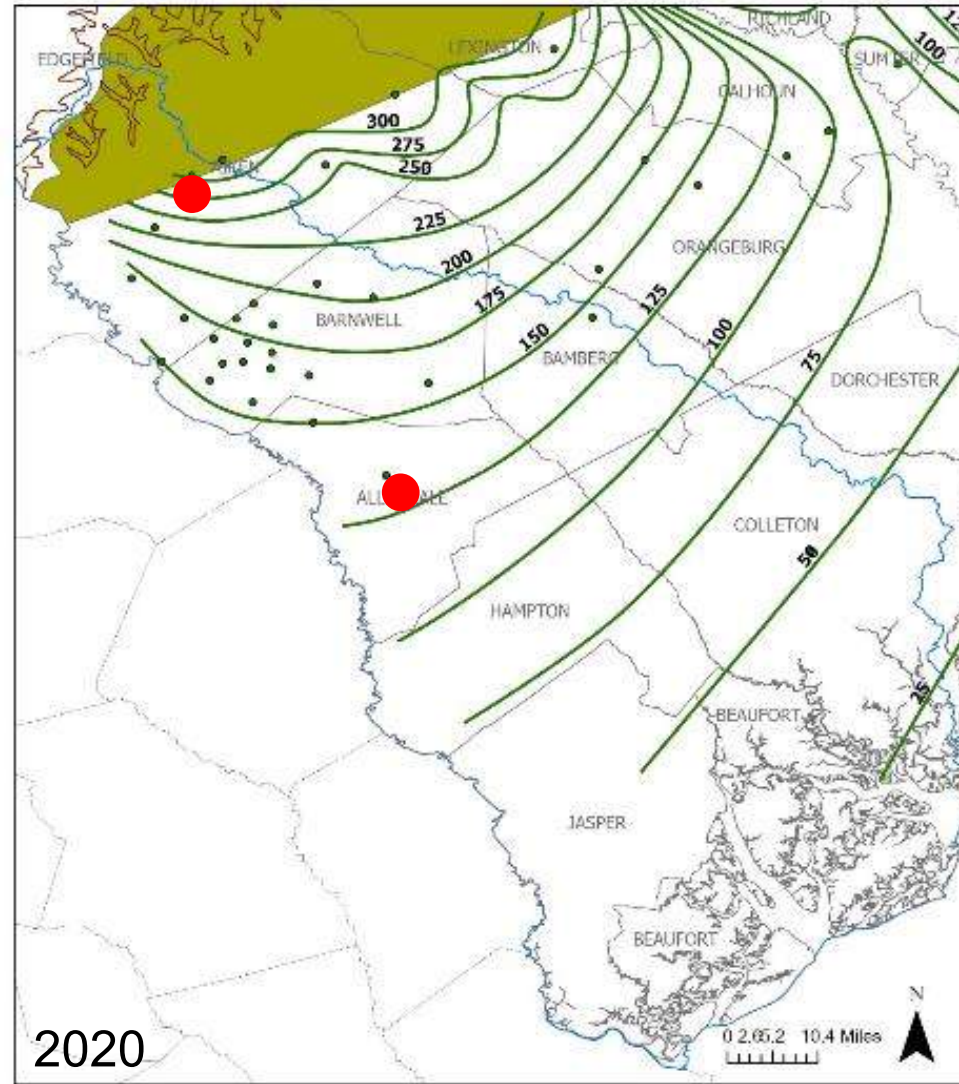


Crouch Branch Aquifer



Predevelopment (1880's)

- ext_crouch_branch_recharge
- Wells predev
- Contours predev (feet, in elevation)



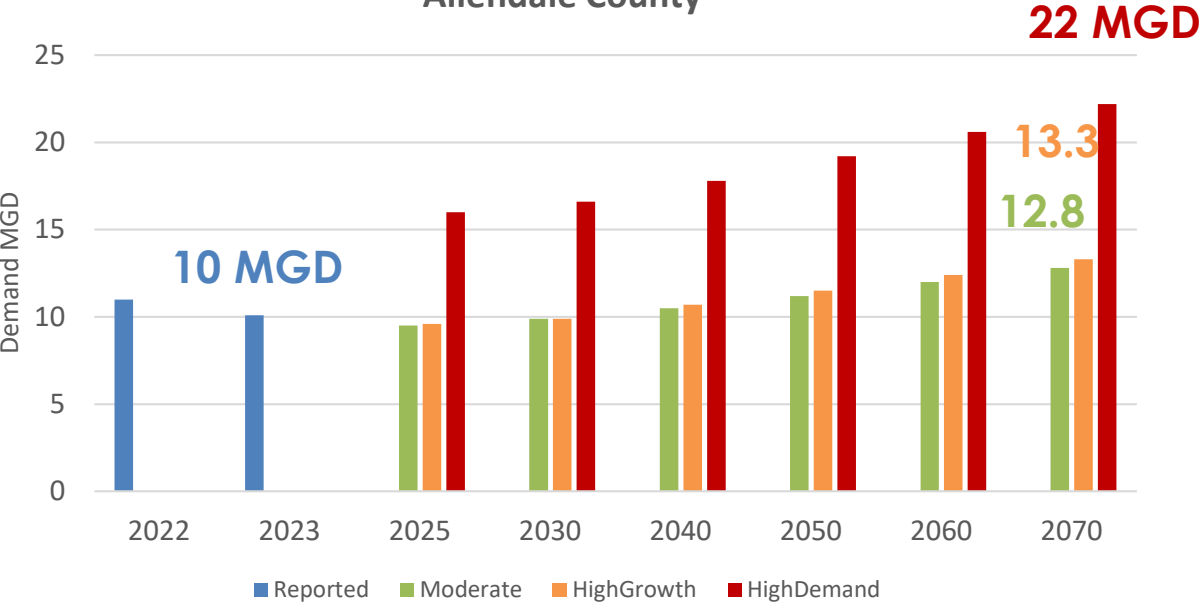
2020

- ext_crouch_branch_recharge
- Wells 2020
- Contours 2020 (feet, in elevation)

- Primarily used for agriculture and water supply in LSS Basins.
- Few wells permitted in the coastal counties due to productive aquifers at shallower depths.
- Declines in the range of 25-50 ft since predevelopment to current day, but very few wells used to create maps
- A general southeastern gradient is present.

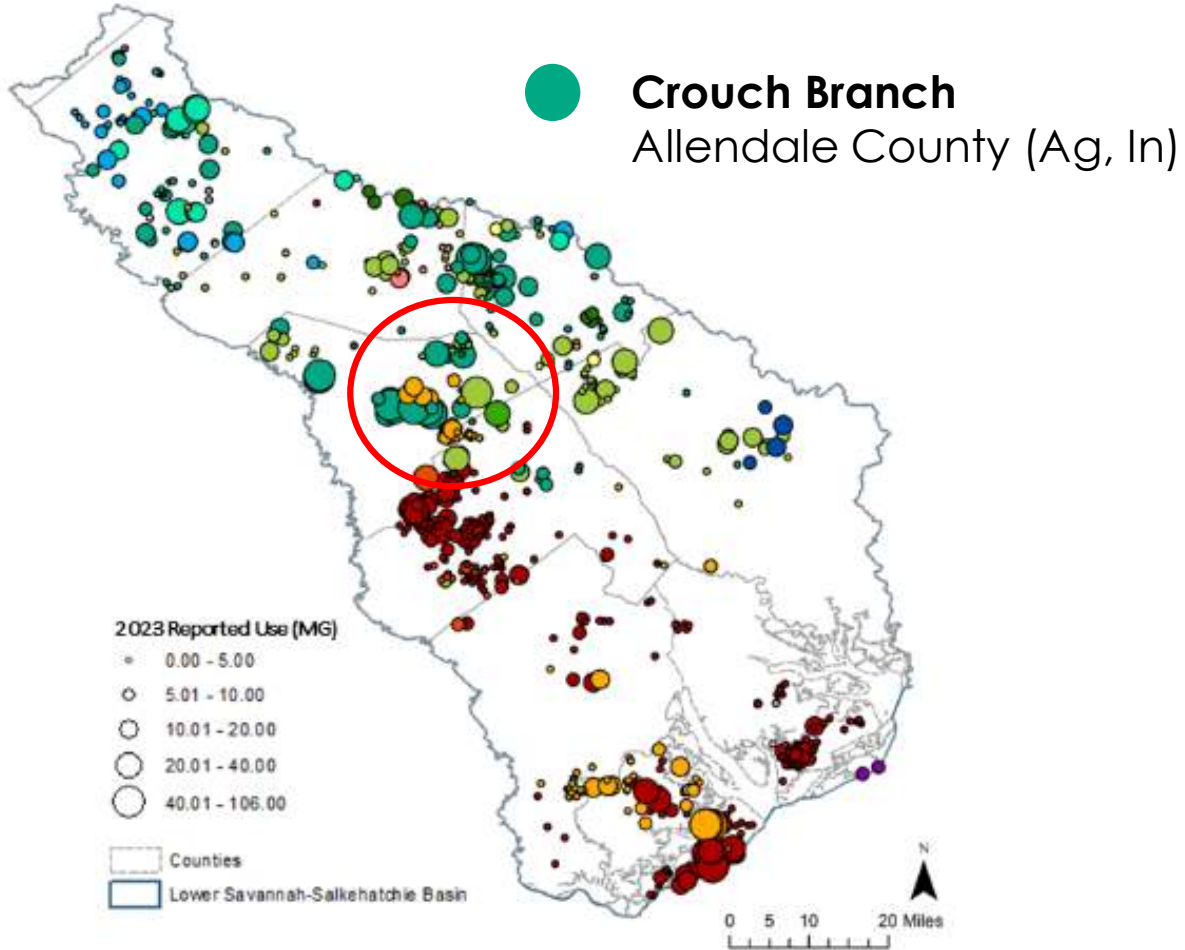
Groundwater Projections – Agricultural Irrigation Allendale County

GW Demand Projection - Agricultural Irrigation
Allendale County



Moderate Demand Scenario: 28% Increase
High Growth Scenario: 33% Increase
High Demand Scenario: 120% Increase

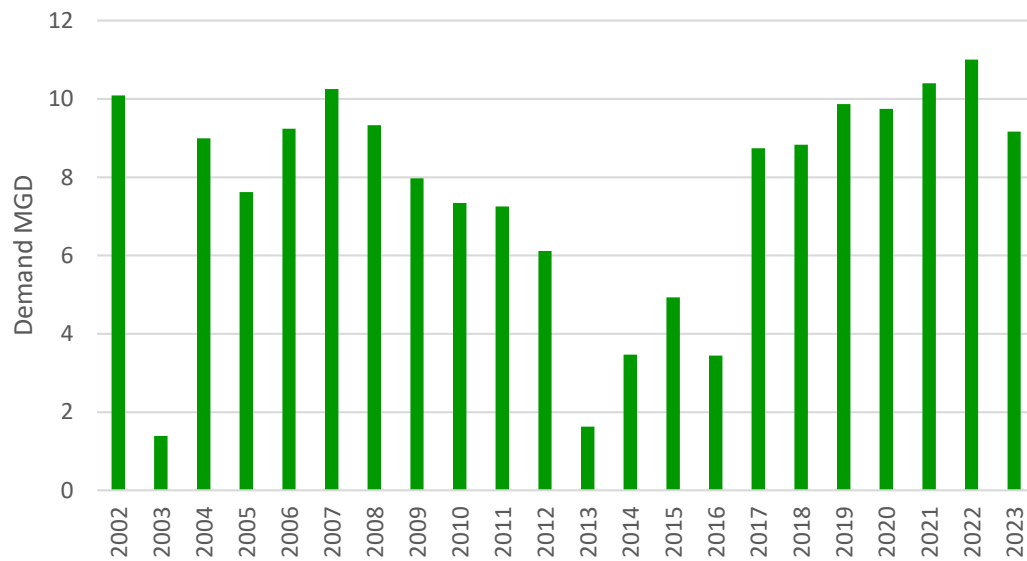
2023 Reported Groundwater Use by Aquifer in the Lower Savannah-Salkehatchie Basin



Agricultural Water Use Crouch Branch Aquifer Near Town of Allendale, Allendale County

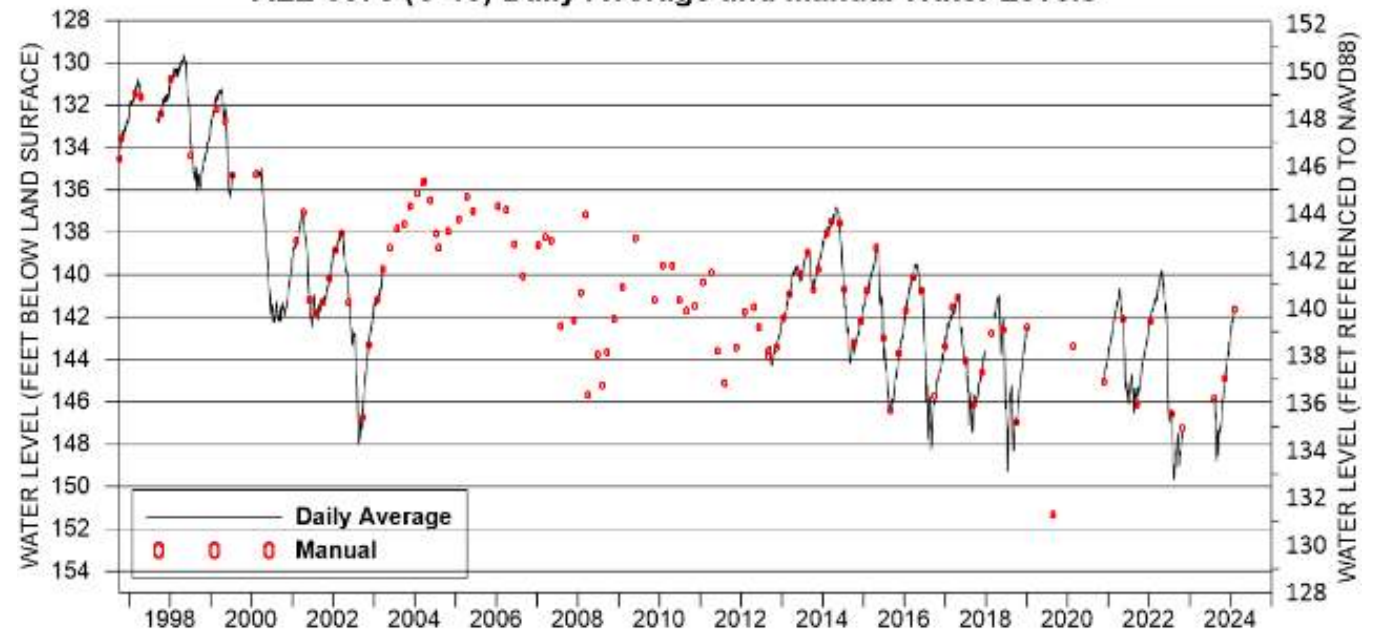


Agricultural Irrigation - Allendale County



**Crouch Branch is the primary Aquifer
Gordon and Floridan secondary**

ALL-0376 (C-10) Daily Average and Manual Water Levels

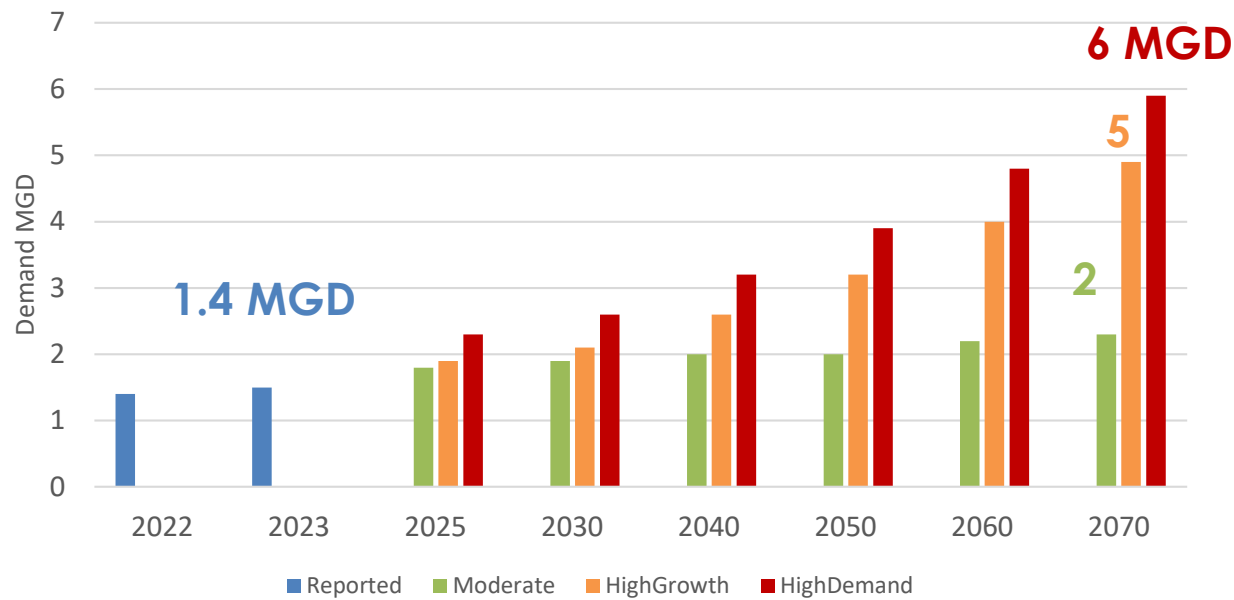


**Aquifer: Crouch Branch
Elevation: 280 ft
Depth: 994 ft
Screen: 784-989 ft**

Groundwater Projections – Industrial Supply

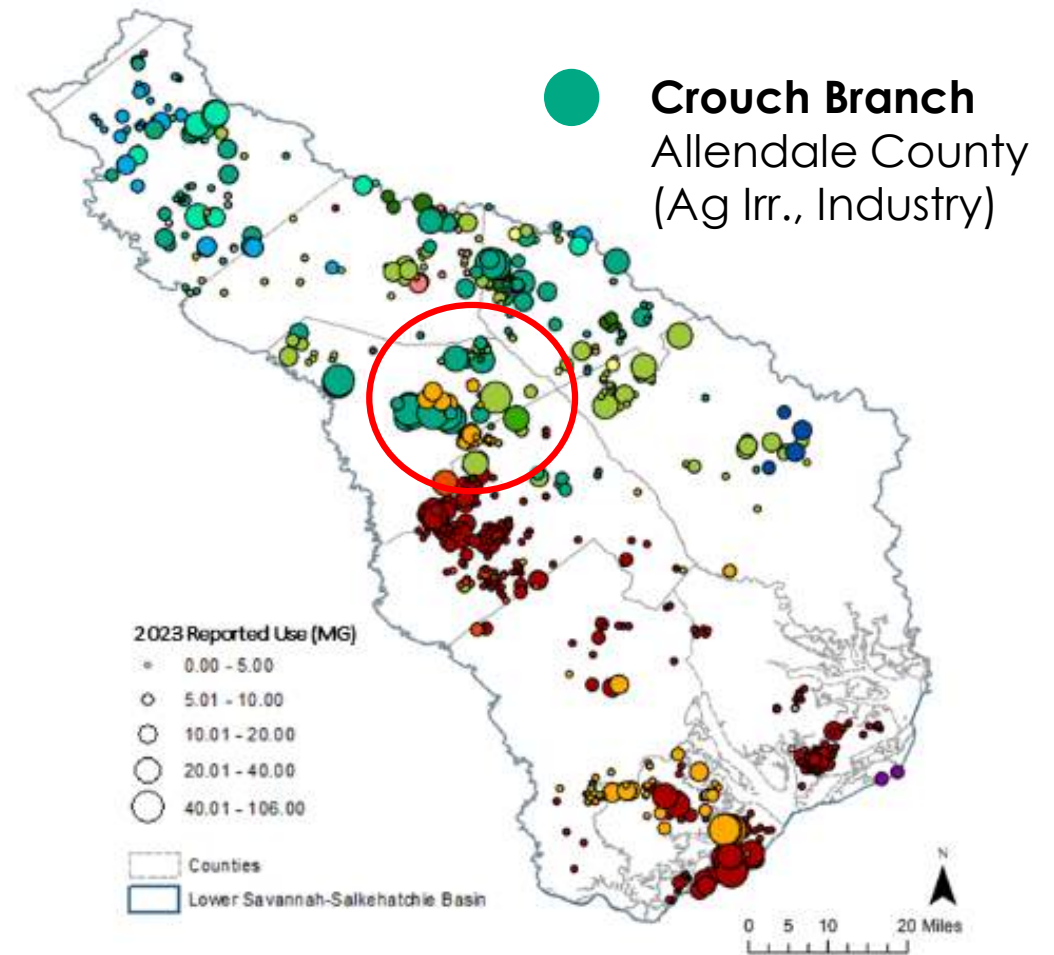
Allendale County

GW Demand Projection - Industrial Supply
Allendale County



Moderate Demand Scenario: 42% Increase
High Growth Scenario: 257% Increase
High Demand Scenario: 328% Increase

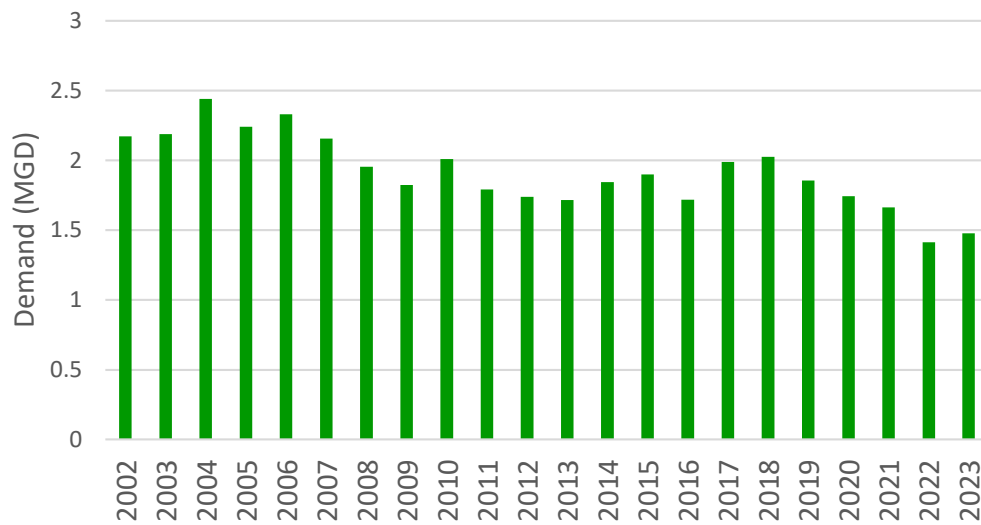
2023 Reported Groundwater Use by Aquifer in the Lower Savannah-Salkehatchie Basin



Industrial Water Use Crouch Branch Aquifer Near Town of Martin, Allendale County

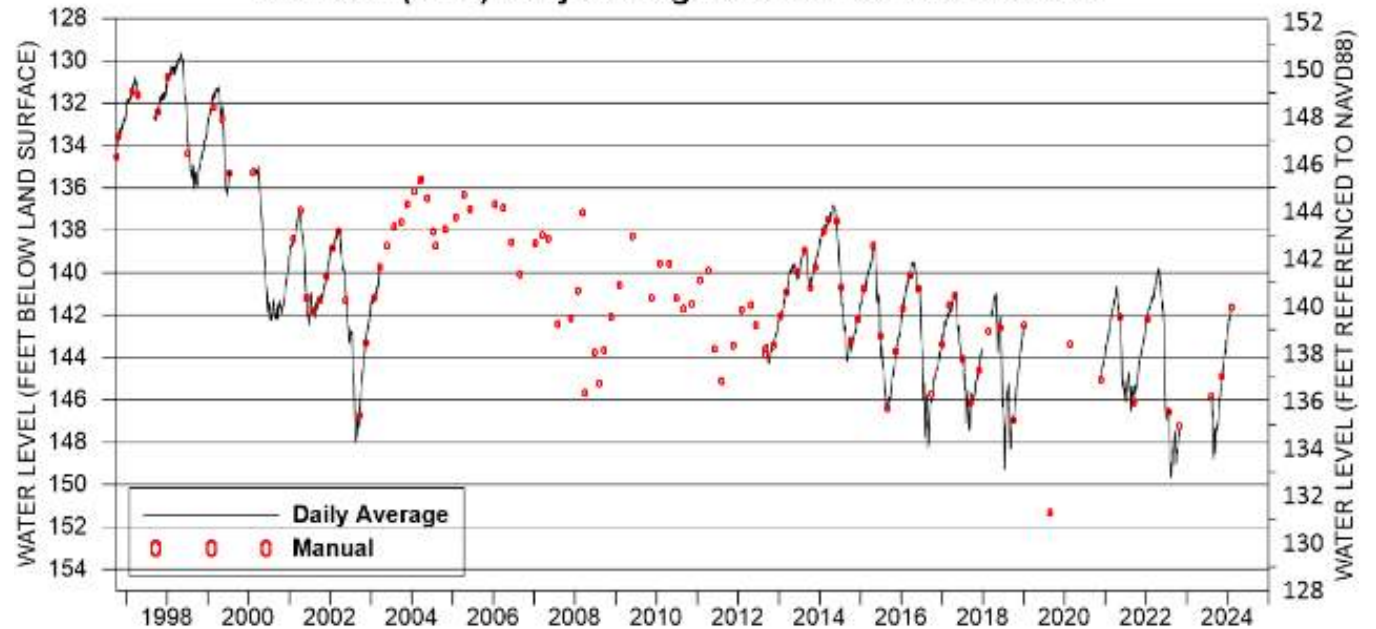


Industrial Supply - Allendale County



**Crouch Branch is the primary Aquifer
Gordon and Floridan secondary**

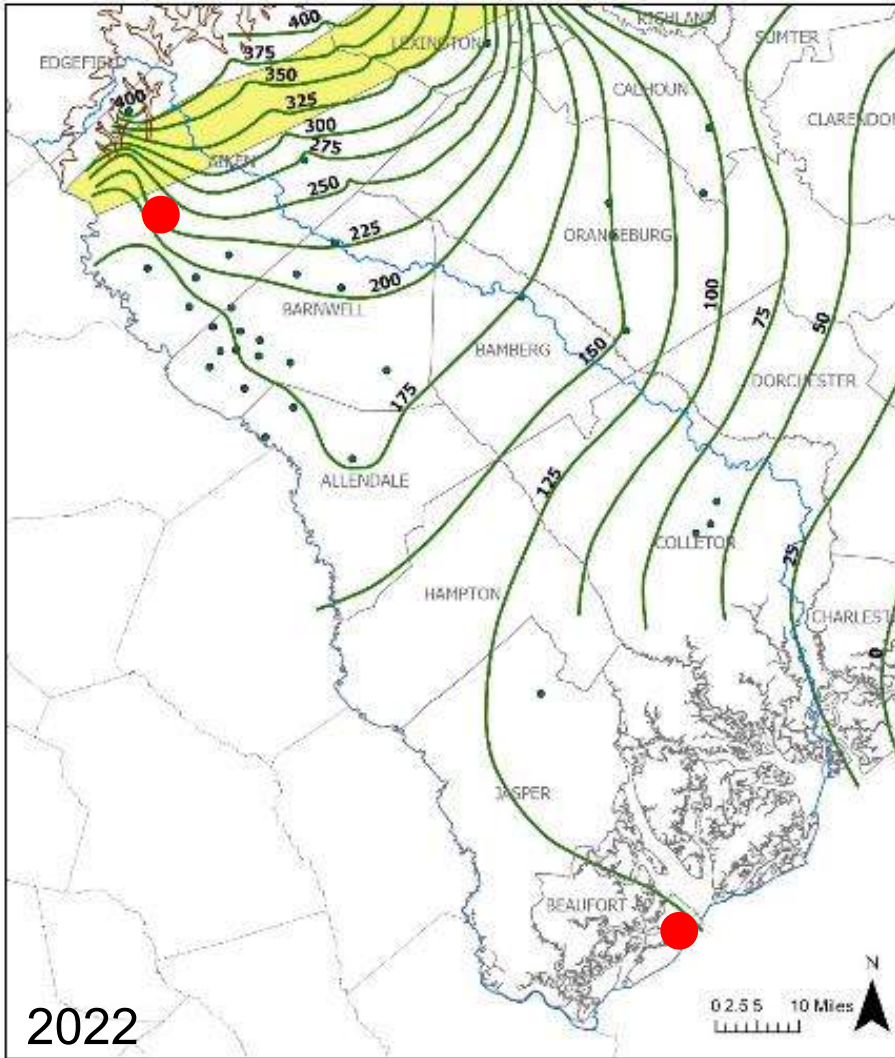
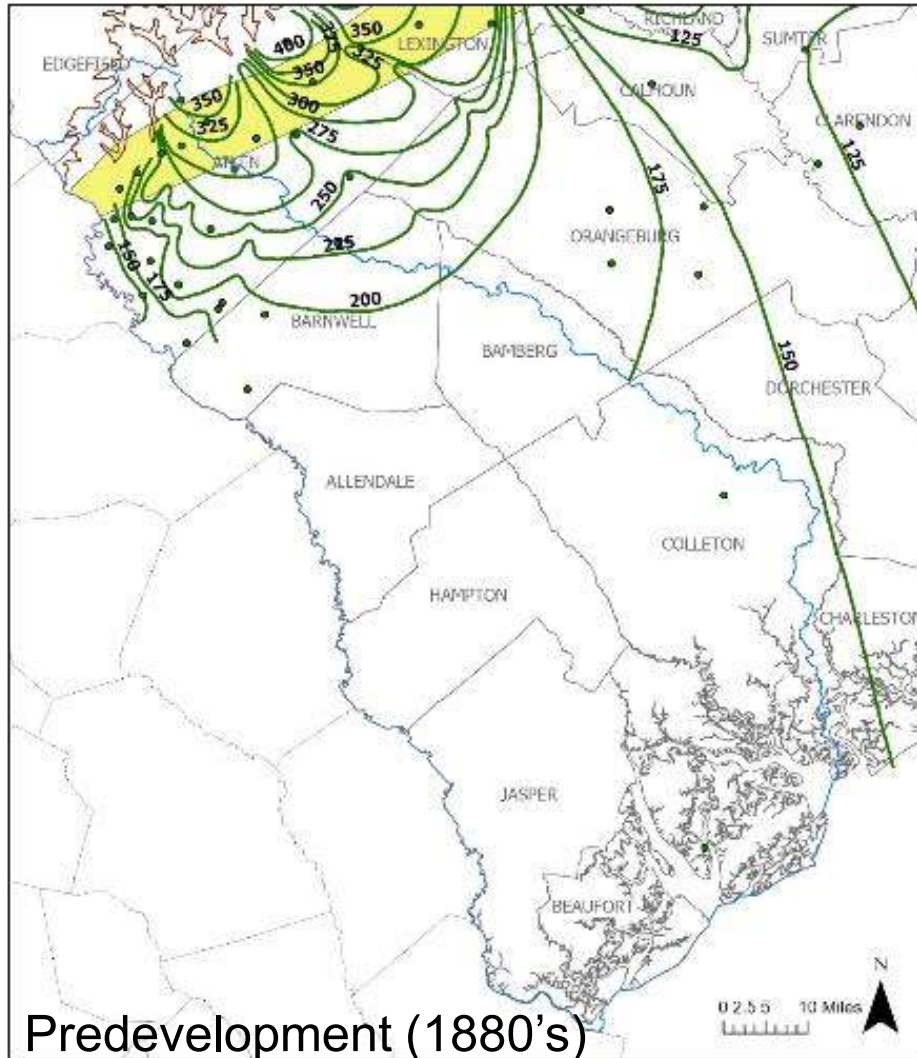
ALL-0376 (C-10) Daily Average and Manual Water Levels



Aquifer: Crouch Branch
Elevation: 280 ft
Depth: 994 ft
Screen: 784-989 ft



McQueen Branch/Charleston/Gramling Aquifers

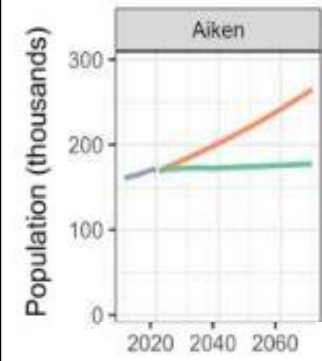
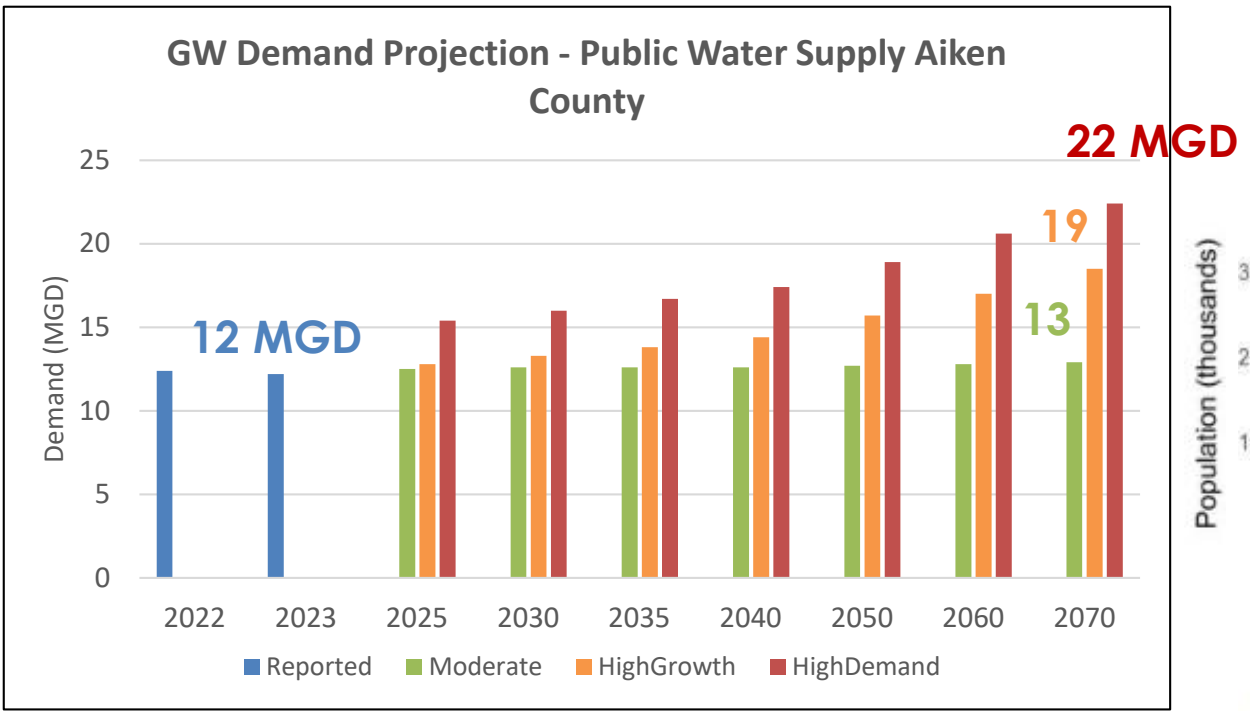


ext. mcqueen_branch_r
• Wells predev
— Contours predev (feet, in elevation)

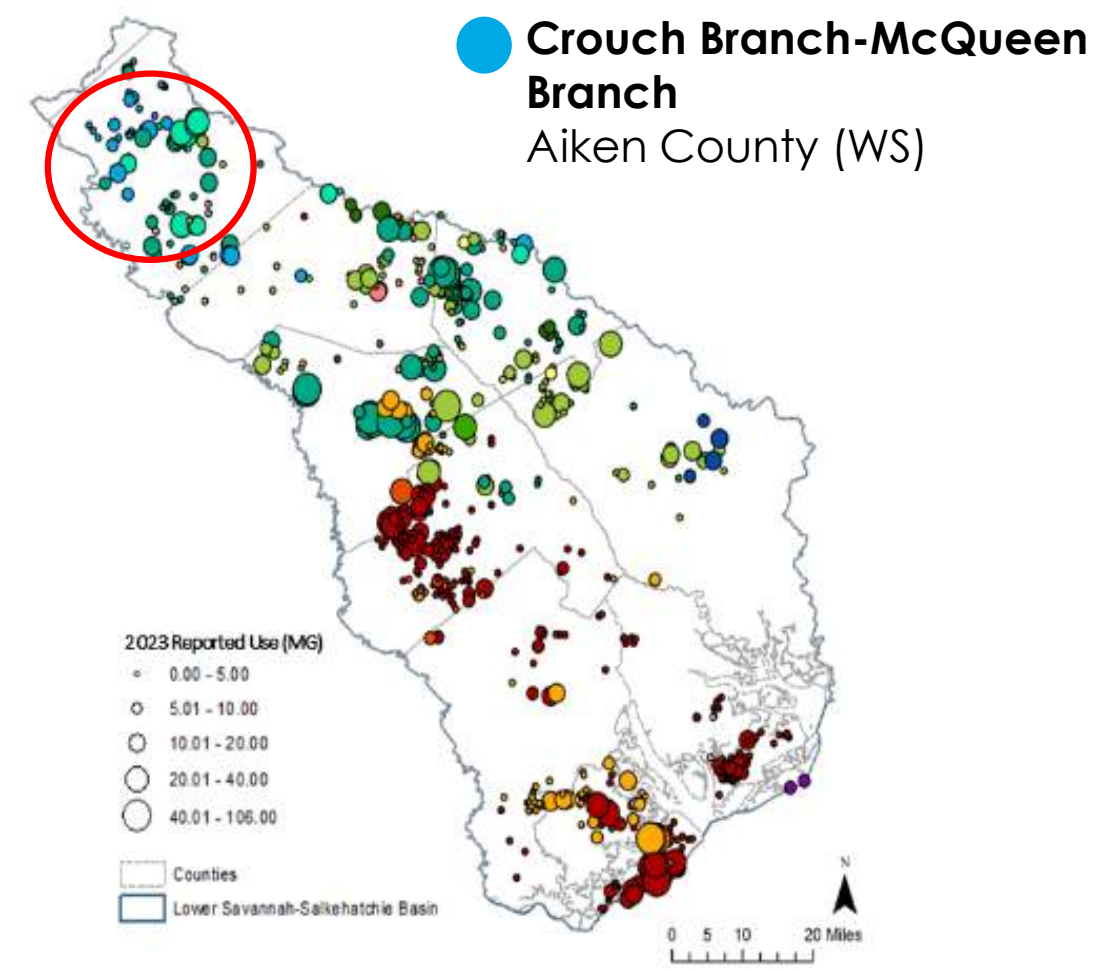
ext. mcqueen_branch_r
• Wells 2022
— Contours 2022 (feet, in elevation)

- Primarily used for water supply, industry, and golf in LSS Basins.
- Few wells permitted in the coastal counties due to productive aquifers at shallower depths, Gramling is used in Hilton Head.
- Minor declines in water level up dip, since predevelopment a general southeastern gradient
- Near surface or flowing conditions near coast.

Groundwater Projections – Public Water Supply Aiken County

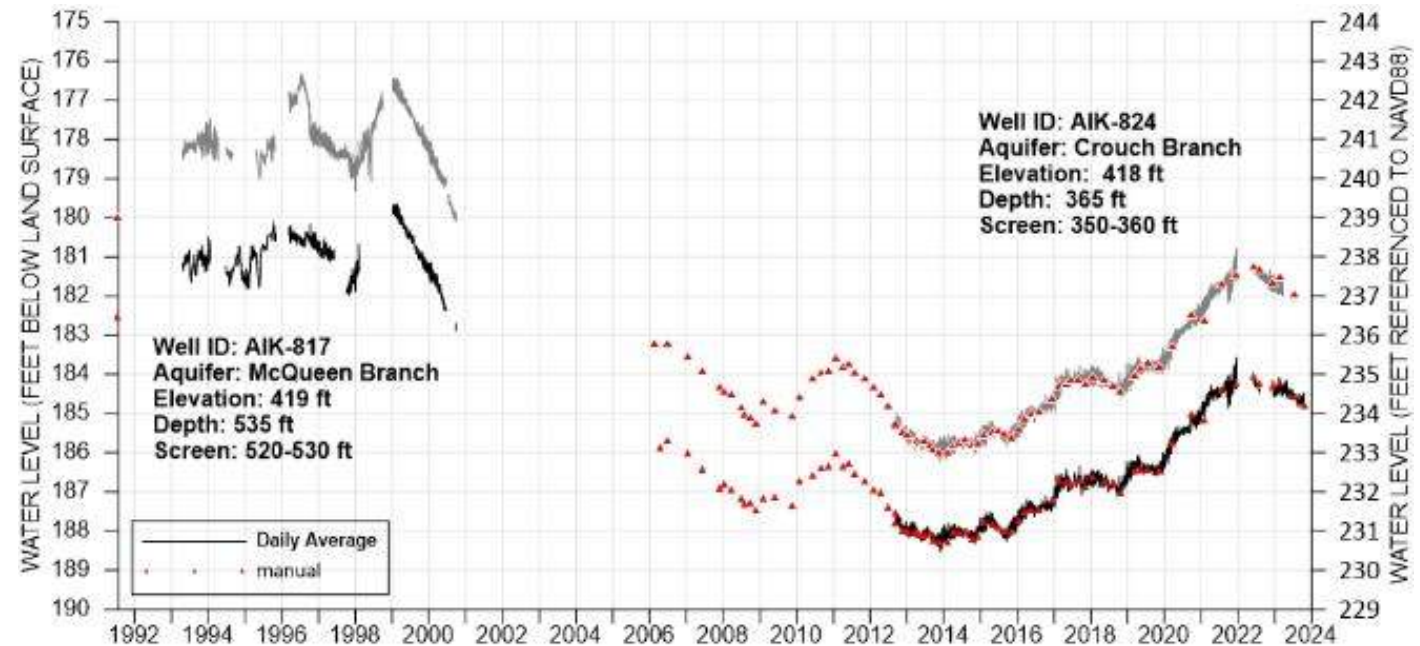
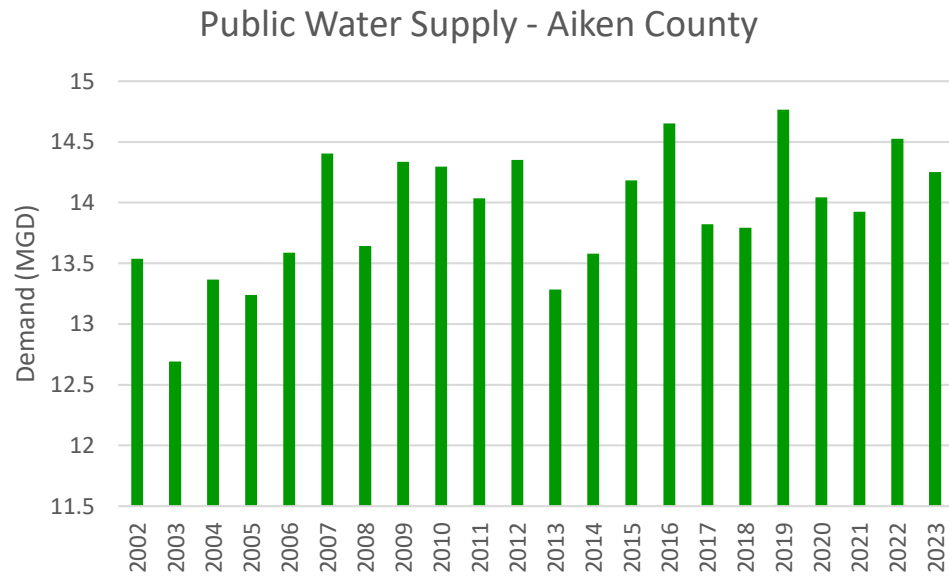


2023 Reported Groundwater Use by Aquifer in the Lower Savannah-Salkehatchie Basin



Moderate Demand Scenario: 8% Increase
High Growth Scenario: 58% Increase
High Demand Scenario: 83% Increase

Public Water Supply Use Crouch Branch and McQueen Branch Aquifers Aiken County



Crouch Branch and McQueen Branch Aquifers are the primary Aquifers, with many cross-screened wells; Aiken also utilizes conjunctive surface water from the Savannah River

Observations

- Under current demand, aquifer levels are generally stable across most aquifers, declines are associated with past drought conditions (middle to upper basin) and both in, and out of basin demand (central coastal regions and Savannah, GA pumping).
- The largest water users in the LSS Basins are public water supply in Beaufort and Aiken Counties, water demand is expected to increase; supply side management should be continued to meet water supply demand and slow saltwater intrusion at the coast.
- Agricultural irrigation is expected to increase in counties located mid-basin; monitoring wells with continuous records are spatially limited to estimate potential future impacts.
- Industrial supply is expected to increase in Allendale Counties, although small volumetric increase, it is a large percentage change.



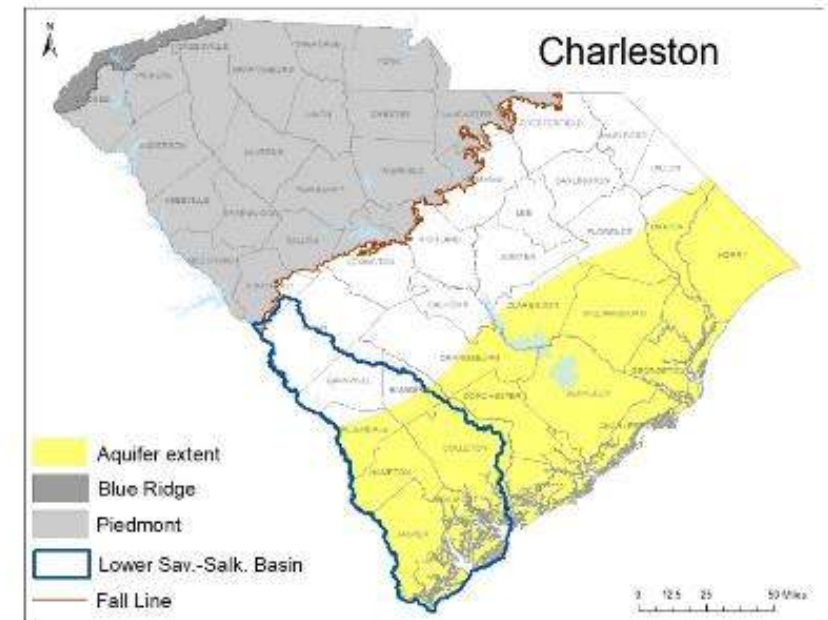
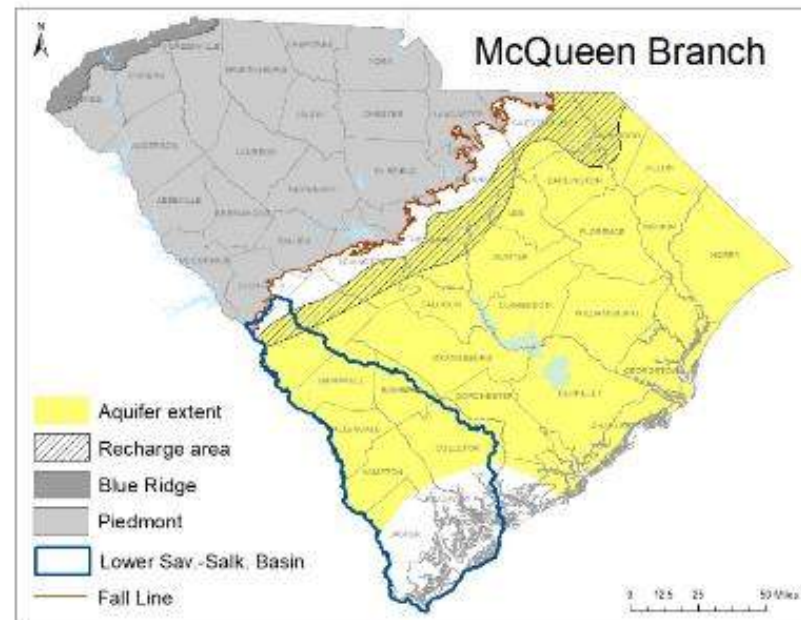
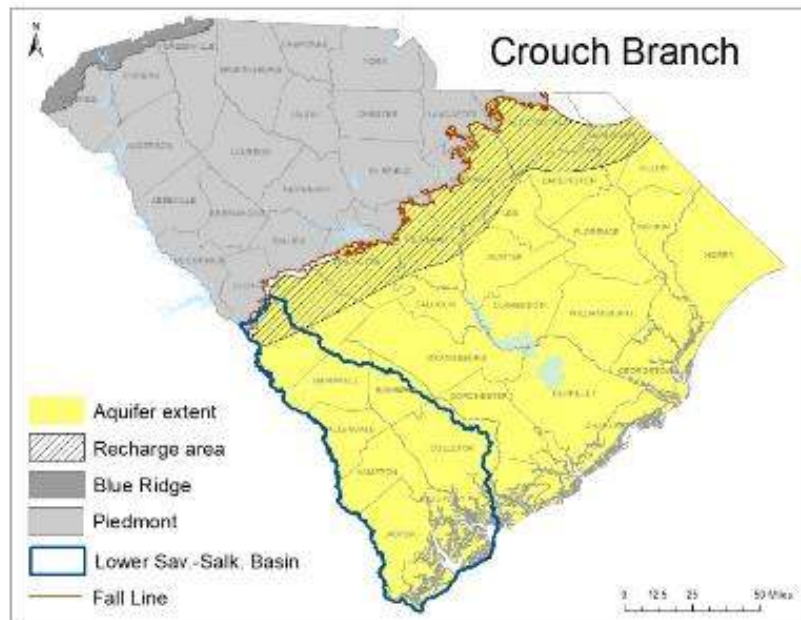
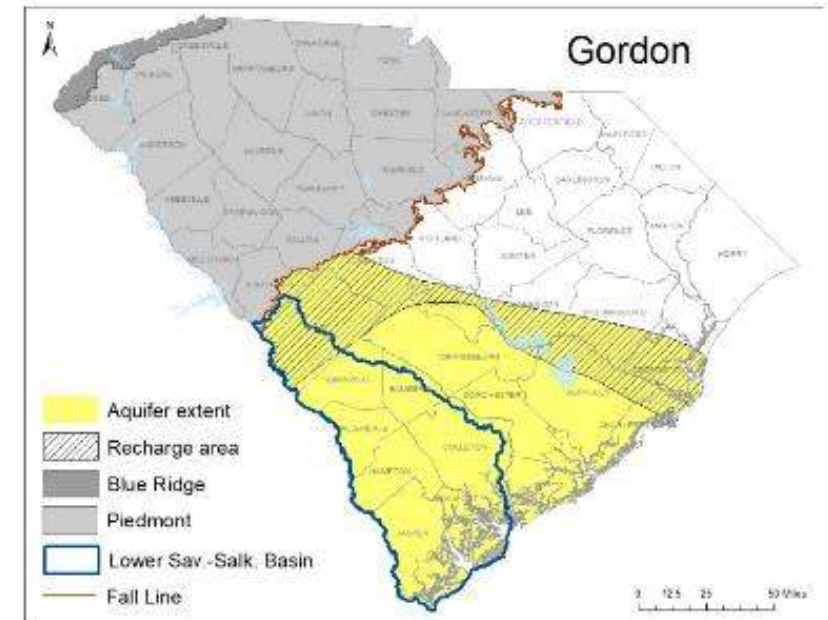
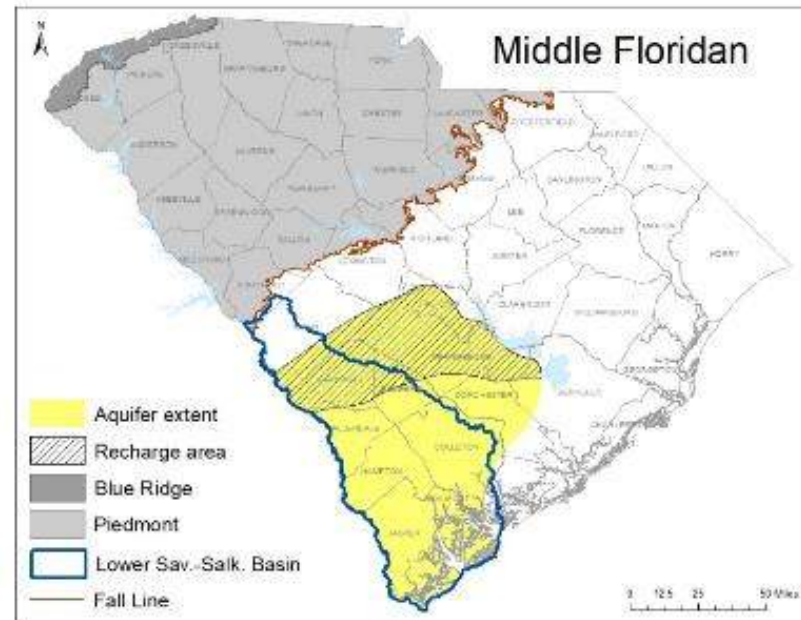
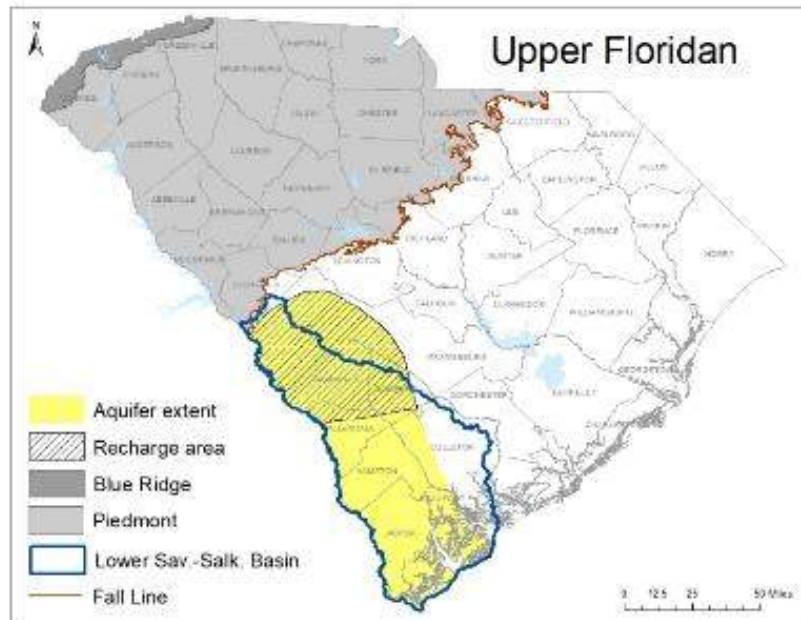
Questions?

Brooke Czwartacki - brooke.czwartacki@des.sc.gov



SC DEPARTMENT *of*
**ENVIRONMENTAL
SERVICES**

Coastal Plain Aquifer Extents and Recharge Areas

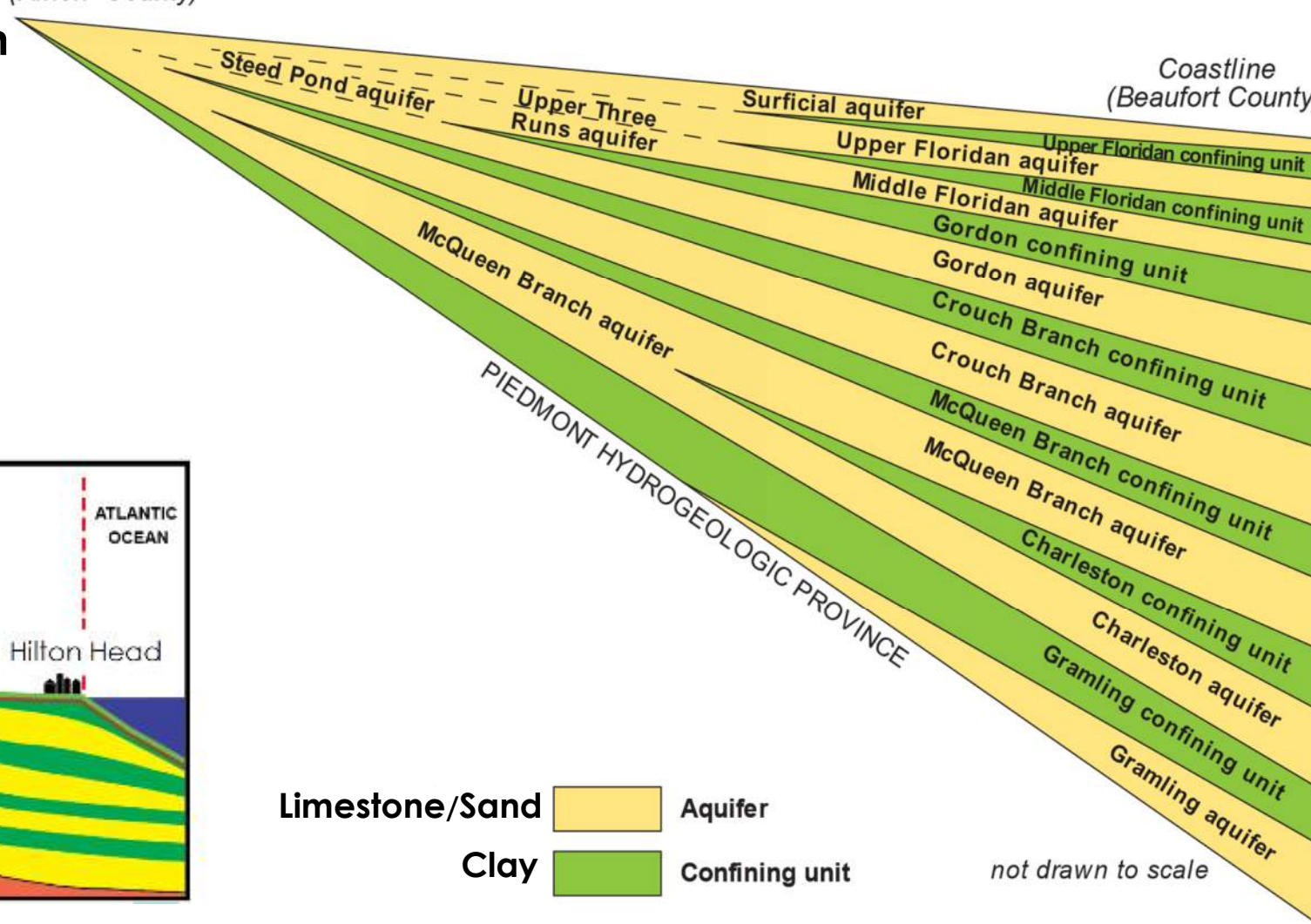
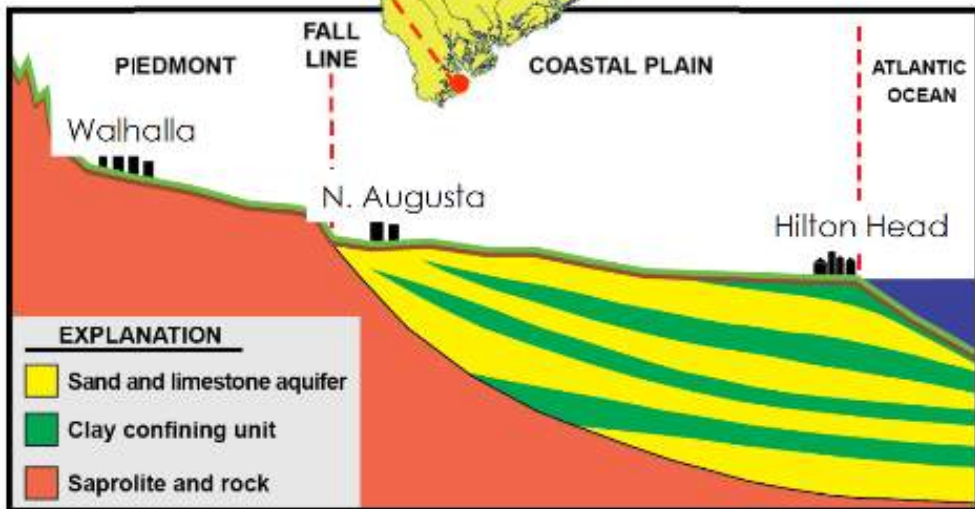
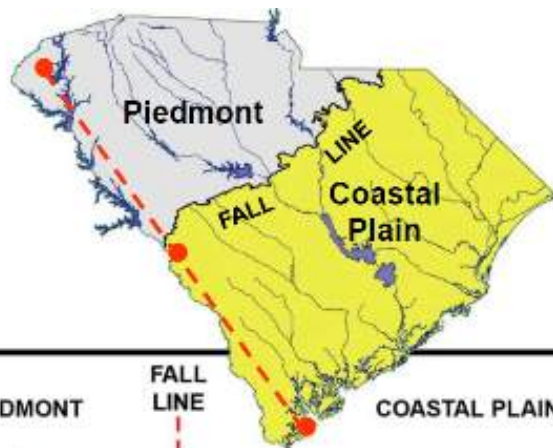


SC Hydrogeologic Framework Along Dip



450 Feet, elevation
Fall Line (Aiken County)

10 Feet, elevation
Coastline (Beaufort County)



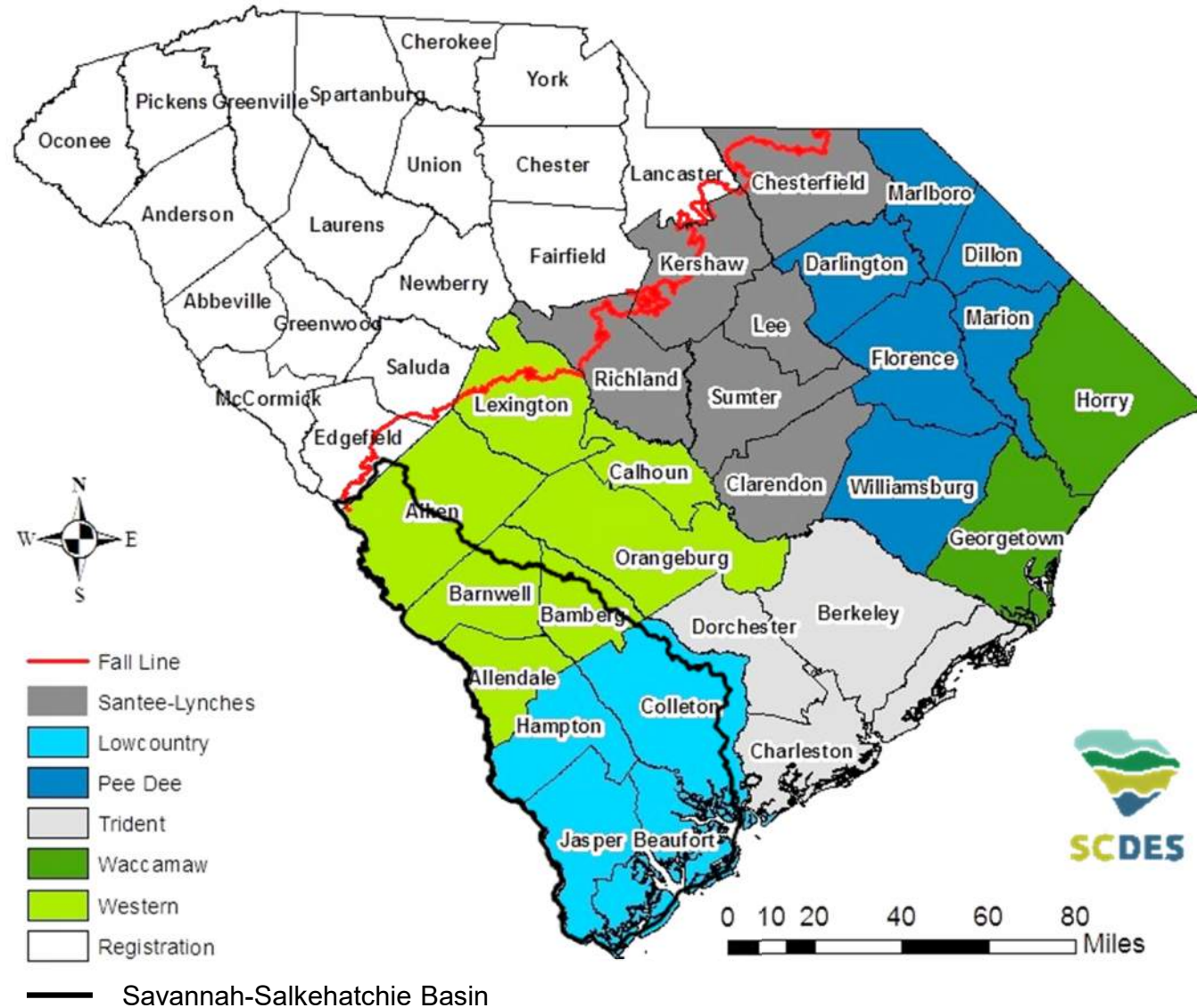
Limestone/Sand Aquifer
Clay Confining unit

not drawn to scale

SOUTHEASTERN COASTAL PLAIN HYDROGEOLOGIC PROVINCE
Limestone
Limestone/Sand
Sand
Sand
Sand
Sand
Sand/Clay

-4000 Feet

Capacity Use Areas



Capacity Use Area

Any user who uses 3 million gallons or more in any month of the year within a CUA is required to apply for a permit. Water use is managed in CUA's to ensure the sustainable and beneficial use of the resource.

Lowcountry (1981)

Beaufort, Colleton, and Jasper Counties, Hampton (2008)

Western (2018)

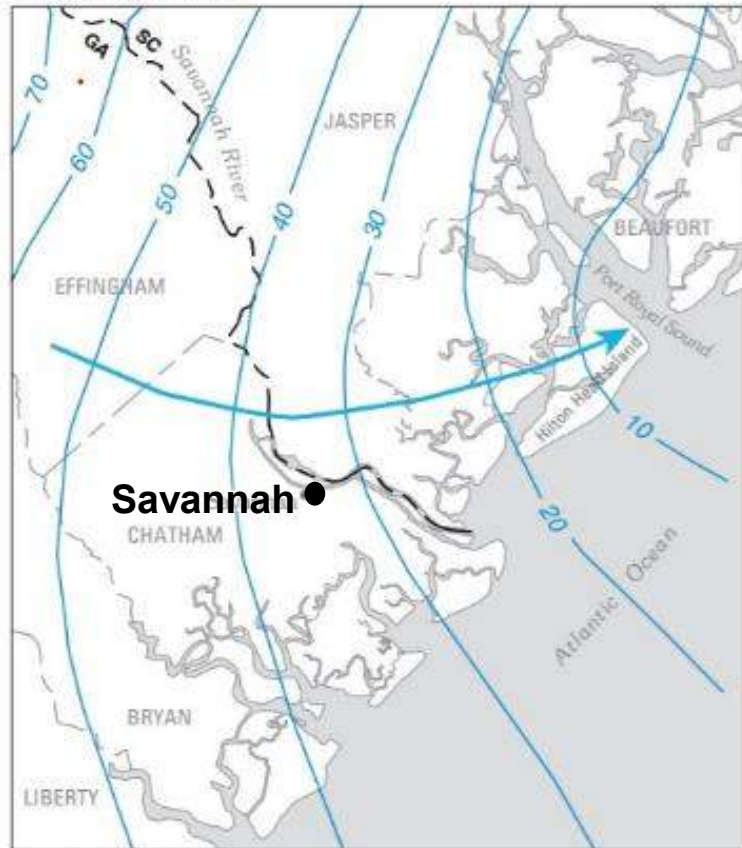
Aiken, Allendale, Bamberg, Barnwell, Calhoun, Lexington, and Orangeburg Counties

Cone of Depression in Savannah, GA



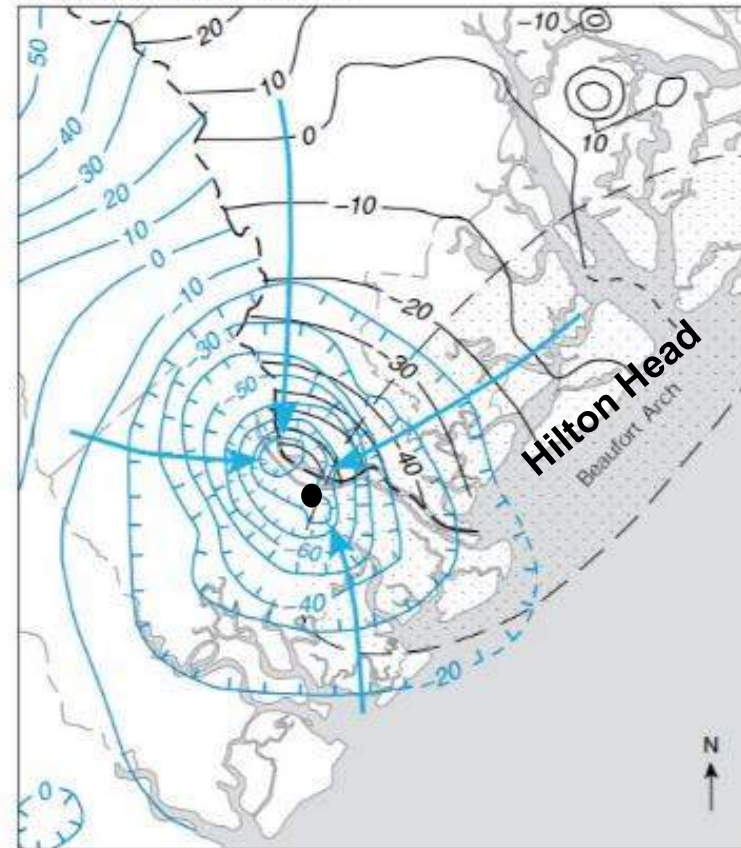
Upper Floridan Aquifer

A. Predevelopment



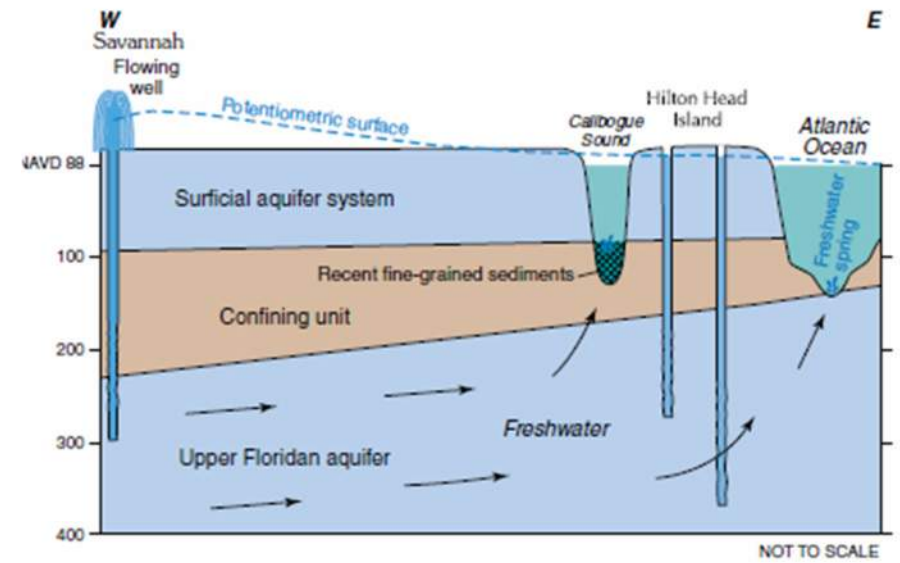
Base from U.S. Geological Survey
1:100,000 and 1:250,000-scale data

B. May and September 1998



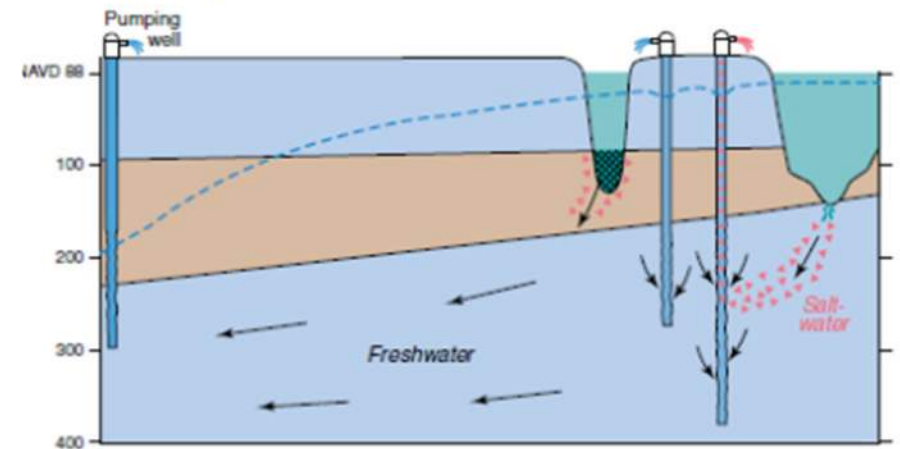
0 5 10 15 MILES
0 5 10 15 KILOMETERS

A. Predevelopment



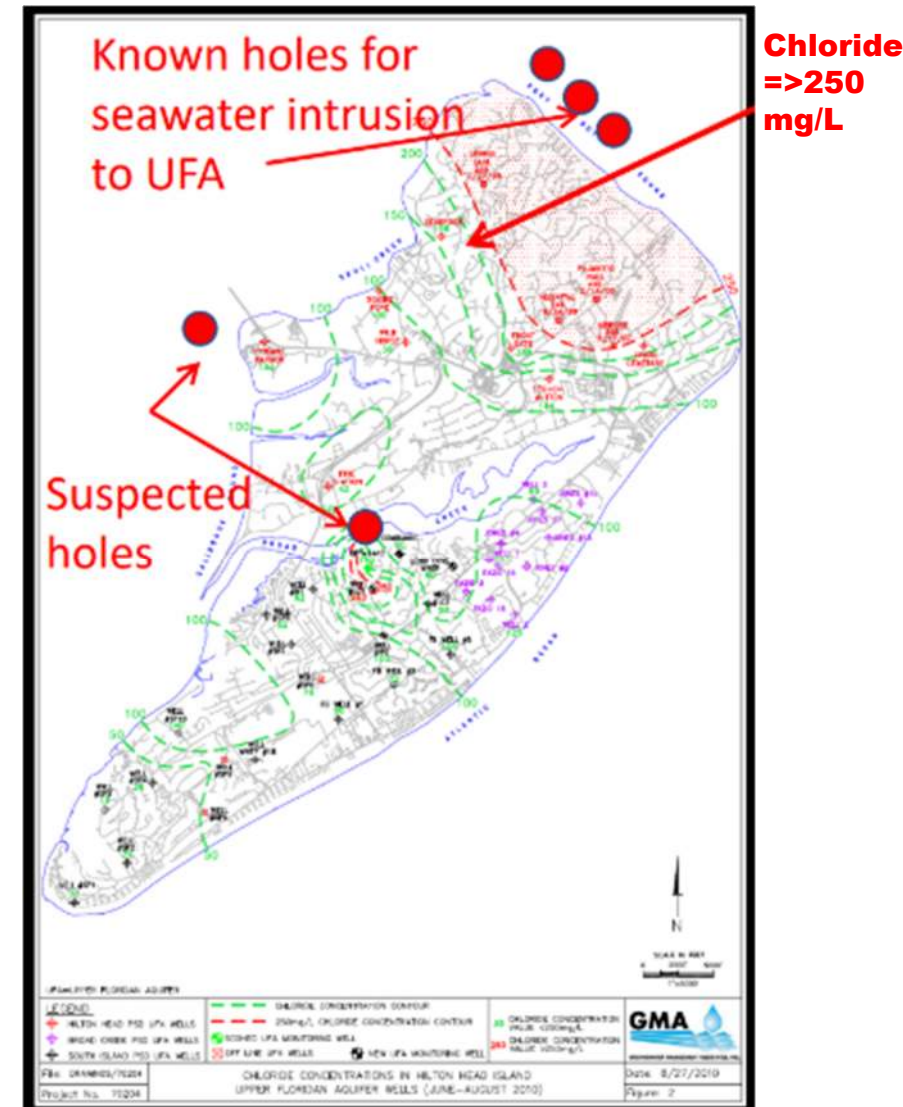
NOT TO SCALE

B. Present day



Saltwater Intrusion at Hilton Head

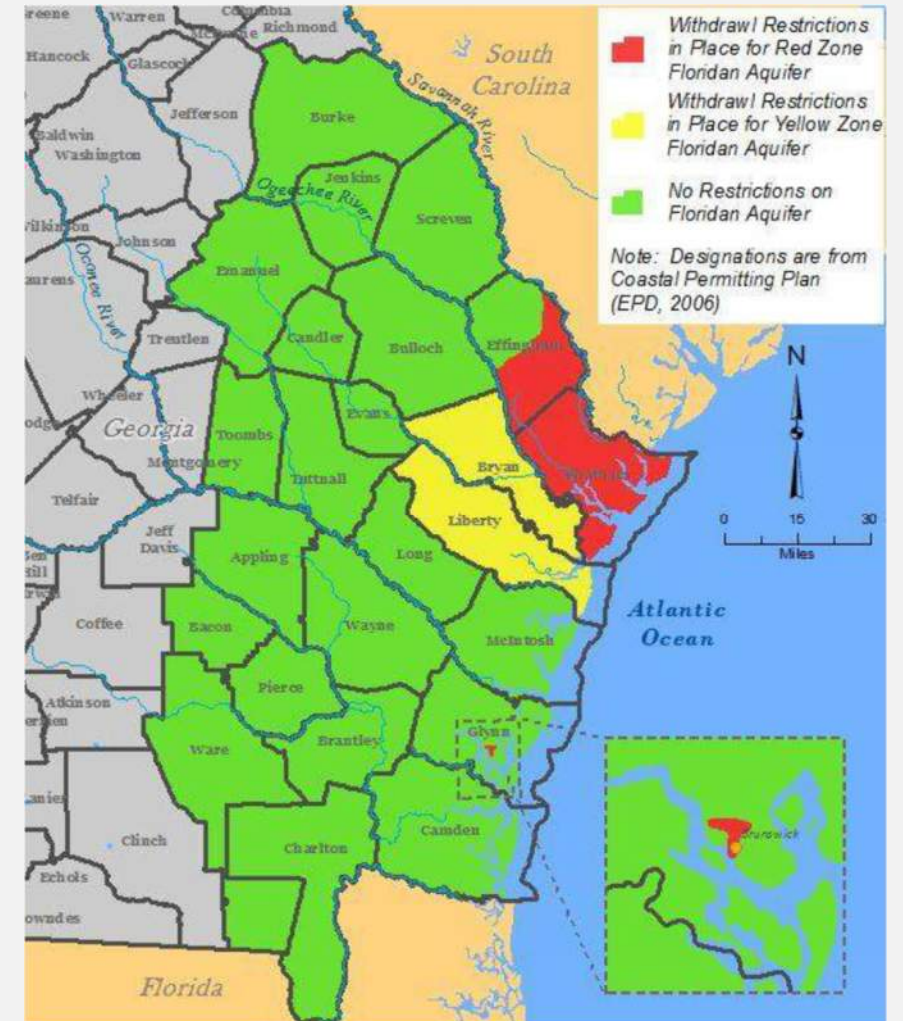
- Hilton Head Island is susceptible to saltwater intrusion due to surface and near surface geology. The thickness of the Upper Floridan confining unit is very thin or absent, leakage of saltwater has occurred in some parts of the island.
- Pumping in both Hilton Head Island and Savannah are factors involved in saltwater intrusion at HHI;
 - reduction in pumping in both pumping centers is required to stop the plume growth, however, plumes will continue to exist and move slowly with the groundwater gradient.
- Hilton Head Public Service District employs several water management strategies to support freshwater supply: these include conjunctive surface water use; aquifer storage and recovery (ASR) and reverse osmosis (RO) of the Middle Floridan Aquifer.



Coastal Georgia Regional Water Plan



- Coastal Georgia Region includes nine counties, two of which border South Carolina (shaded red; Effingham and Chatham Counties).
- Groundwater is mainly from the Floridan aquifer and supplies 65% of the Coastal Georgia Region.
- Findings from the 2023 update determined that at a regional level, modeled aquifers have sufficient groundwater to meet forecasted needs over the planning horizon to 2060, but challenges will occur in areas where saltwater intrusion is an issue.
- Historic groundwater withdrawals in both Savannah and Hilton Head areas have contributed toward the inland movement of saltwater plumes in SC. These plumes would continue to exist well into the future even if all groundwater withdrawals were eliminated.



<https://waterplanning.georgia.gov/coastal-georgia-regional-water-plan>