Georgia's

State Water Plan

Regional Water Development and Conservation Plan Review and Revision
Coastal Georgia Water Planning Council
November 17, 2016

www.georgiawaterplanning.org

Council Meeting 3 Agenda

Georgia's State Water Plan

Coastal Georgia Regional Water Council Meeting 3
Agenda – Thursday November 17, 2016

Meeting Objectives:

1) Debrief with Council Members from Joint Meeting earlier in the day
2) Council Meeting Business

10:00 a.m. – 1:15 p.m.	Joint Council Meeting (Covered under separate agenda)
1:15 p.m. – 2:15 p.m.	Debrief with Council Members from Joint Meeting earlier in the day • Comparison of available resource capacity • Review and discuss management practices • Joint coordination items
2:15 p.m. – 2:25 p.m.	Council Meeting Business • *319h Grant Update* • *Approve meeting minutes from June 23, 2016 Council Meeting* • *Follow-up discussion from September 16, 2016 "Office Hours" Teleconference* • *Discuss optional Council Meeting 6 to finalize plan review & revision process* • *New Business*
2:25 p.m. - 2:30 p.m.	Public Comment Period
2:40 p.m. - 4:00 p.m.	Joint Council Meeting (Covered under separate agenda)
4:00 p.m.	Adjourn

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De-Brief from Breakout Sessions

- What did the Council learn during the Breakout Sessions and what are the implications for their Plan updates?
- Can the Council identify any specific management practices that need to be addressed in light of the result of the Resource Assessment updates?
- What topics or messages would be most beneficial to bring back and share with other Councils at the Joint Council Meeting?
- Has the Council identified any further joint coordination items that the Council wants to see occur prior to finalizing updates of their Plans?

Georgia's

State Water Plan

Summary of Available Resource Capacity

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Demand Forecasting Summary Statistics

- Population Changes over the Planning Period (2015 – 2050)

Counties with Highest Projected Population Growth	**% Change**	**Bryan**	**141%**
		Long	**111%**
		Effingham	**90%**
	# People	**Chatham**	**119,600**
		Effingham	**51,200**
		Bryan	**49,300**

Counties with Lowest Projected Population Growth	**% Change**	**McIntosh**	**-29%**
		Liberty	**10%**
		Camden	**26%**
	# People	**McIntosh**	**-4,000**
		Liberty	**6,800**
		Camden	**13,800**

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Demand Forecasting Statistics (cont.)

- Water Demand over the Planning Period (2015 – 2050)

Counties with Highest Water Demand Increase (Excluding Agriculture)			
	% Change	Bryan	164%
		Long	98%
		Bulloch	63%
	MGD	Chatham	25
		Effingham	13
		Glynn	9

*Red text denotes counties with highest population growth statistics

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Demand Forecasting Statistics (cont.)

- Water Demand by Source Type over the Planning Period (2015 – 2050)

Counties with Highest Surface Water Demand Increase (Excluding Agriculture)	% Change	Effingham	40%
		Chatham	26%
		-	-
	MGD	Chatham	15
		Effingham	8
		-	-

Counties with Highest Groundwater Demand Increase (Excluding Agriculture)	% Change	Bryan	164%
		Long	98%
		Bulloch	63%
	MGD	Chatham	10
		Glynn	9
		Bryan	7

*Red text denotes counties with highest population growth statistics

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Demand Forecasting Statistics (cont.)

- Wastewater flows over the Planning Period (2015 – 2050)

Counties with Largest Increase in Wastewater Flows			
	% Change	Bryan	137%
		Long	97%
		Bulloch	52%
	MGD	Chatham	15
		Bryan	7
		Glynn	5

*Red text denotes counties with highest population growth statistics

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Magnitude of Surface Water Gaps

- Round 2 Current Condition Results
- Preliminary analysis indicates that the majority of surface water usage is agriculture-related at these planning nodes

Node	Length of Shortfall (% of Time)	Average Shortfall (MGD)	Counties Affected**	Shared Resource with:
Claxton*	21	4	Bulloch	Altamaha
Eden	6	10	Bryan, Bulloch, and Effingham	SUO, UO, and Altamaha
Kings Ferry	6	23	Bryan, Bulloch, Chatham, Effingham, Liberty, and Long	Altamaha and SSA

*Denotes node outside of region
**Counties affected were identified based on local drainage areas upstream of the planning node
Source: State Water Plan Surface Water Availability Resource Assessment (Zeng, 2016)

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Coastal Georgia Region Gap Summary

- Surface Water Resource:
  - All the potential gaps are surface water quantity related
    - Claxton, Eden, Kings Ferry
  - Within the region, all non-agricultural water surface water use occurs at planning nodes with no gaps
  - Therefore, management practices can:
    - Focus on agriculture to address potential surface water gaps
    - Consider groundwater as a resource to make up a portion of the potential gap
    - Consider other demand reduction options
    - Other

Coastal Georgia Region Gap Summary (cont.)

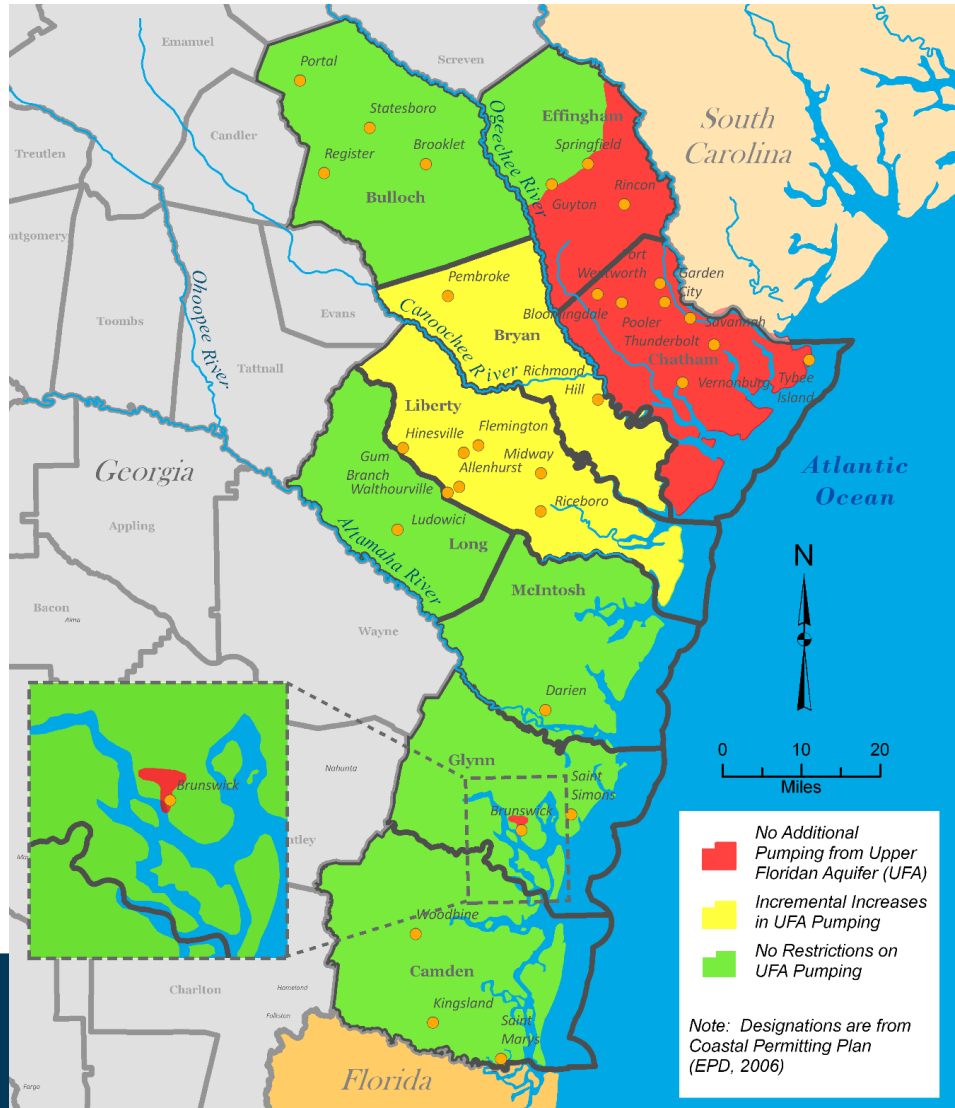
- Groundwater Resource
  - Consistent with Round 1, there are no gaps in the modeled portions of the Floridan Aquifer (outside Red and Yellow Zones)
  - The 4 County Red and Yellow Zones are subject to a moratorium on future withdrawals and municipal, industrial, and energy permit holders have had reductions to their permit limits
    - Potential gaps in groundwater in this portion of the region
    - Increased coordination & discussion within and between Councils

Coastal Georgia Region Gap Summary (cont.)

- Groundwater Resource
  - Chatham, Glynn, Bryan, and Bulloch Counties have highest forecasted increases in groundwater use
  - Continue water conservation practices
  - Additional management practices will be needed to address growing water needs

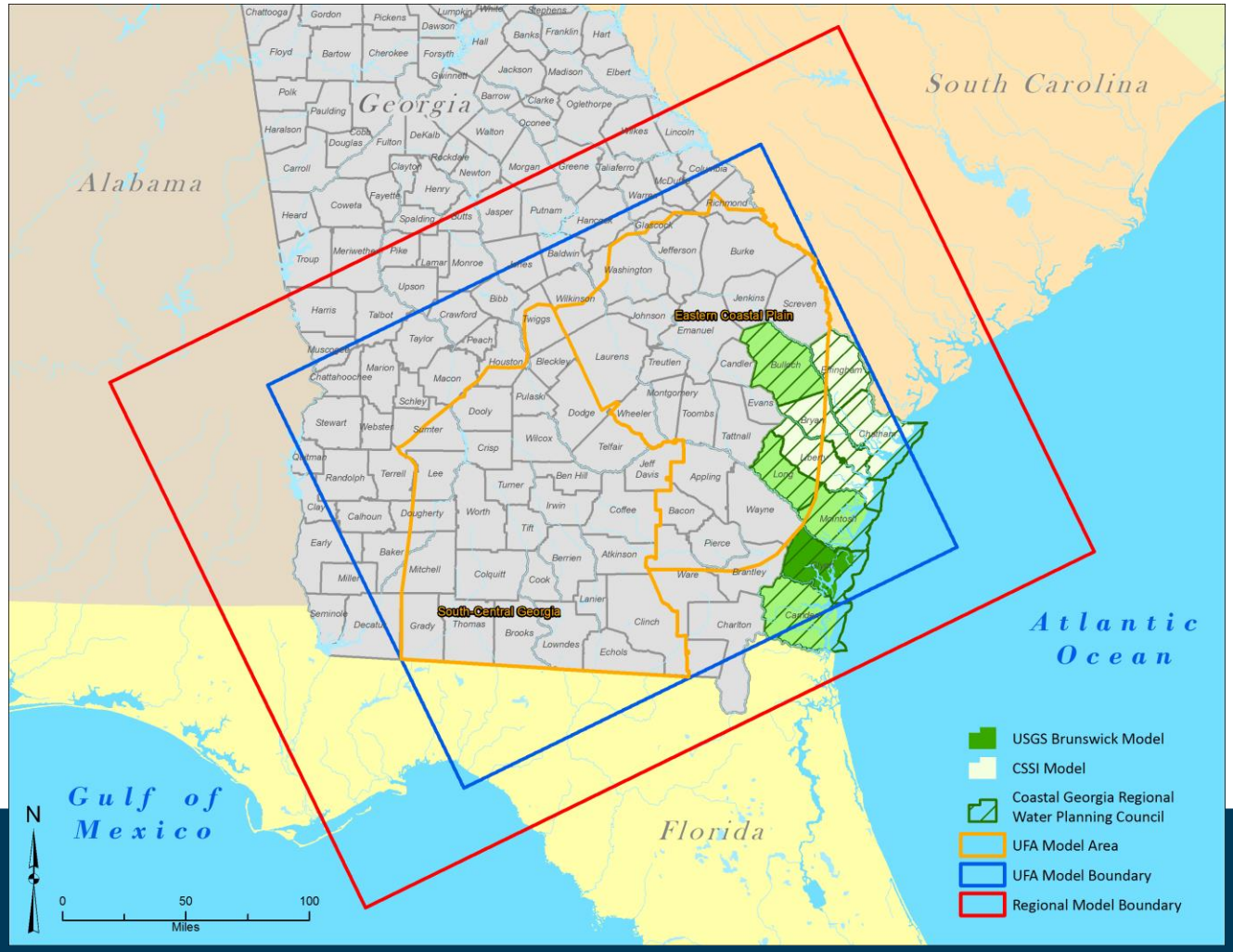
Location of Red and Yellow Zones

- Four counties have been the major focus of resource management efforts:
  - Bryan
  - Chatham
  - Southeastern Effingham
  - Liberty
- Also includes a small portion of Glynn County



Groundwater Modeling of the Floridan Aquifer

- Floridan Aquifer model boundaries used for determining sustainable yield
  - CSSI Model used for evaluating Salt Water Intrusion



Overview of Salt Water Intrusion – A Quick Look Back

- 1916 - first documented Salt Water Intrusion in upper Floridan Aquifer – Paris Island SC
- 1941 - Stringfield and 1944 Warren identify potential for Salt Water Intrusion in areas east and northeast of Savannah
- 1954/55 - first two test wells drilled in Hilton Head Island (HHI)
- 1960's - residences of HHI begin to notice evidence of increased chloride
- 1981-1990 - SC Water Resources Commission identifies chloride in 2 HHI wells

Overview of Salt Water Intrusion (Cont.)

- 1964 - 1984 – HHI no significant increases in chloride and most places concentrations are < 100 mg/L
- 1984 - early modeling by Voss of salt water intrusion using Saturated-Unsaturated Transport Model (SUTRA)
- 2000 - 3 wells on HHI begin to be taken out of production due to salt water intrusion
- 1997- Georgia initiates Interim Strategy for managing salt water intrusion 2 stage approach
  - Establish limits on withdrawal permits
  - Launch $18 million Coastal Sound Science Initiative (CSSI)

Overview of Salt Water Intrusion (Cont.)

- 2006 – Georgia develops Coastal Georgia Water and Waste Water Permitting Plan for Managing Salt Water Intrusion (CPP)
- 2007 – Georgia and SC sign Memorandum of Understanding to manage salt water intrusion
- 2010/2011 – Salt Water Intrusion Steering Committee (bi-state effort) meet to discuss science and possible solutions
- 1997- Present – Groundwater model(s) are improved and refined (USGS Coastal Model, CDMDYSYSTEM)

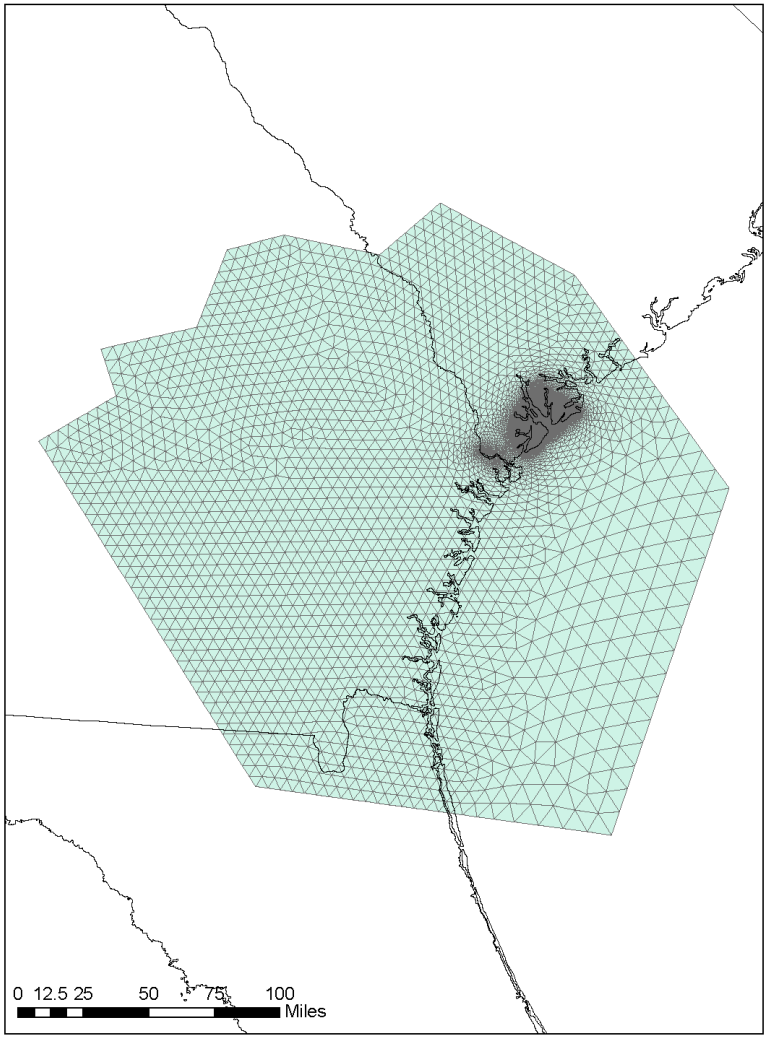
Overview of Salt Water Intrusion (Cont.)

- 2013 – Georgia EPD places moratorium on future use of the Floridan aquifer in the Red and Yellow Zones
- June 2014 – Georgia EPD convenes stakeholder process with municipal, Industrial and Energy Florian Aquifer permit holders to develop a groundwater permit reduction strategy
- 2015 – Georgia EPD announces further reductions in groundwater withdrawal permits in the Red and Yellow Zones

Evaluating Salt Water Intrusion

- Salt water intrusion evaluation in Savannah-Hilton Head area
  - Coastal Sound Science Initiative (CSSI) model
- Groundwater withdrawal limits in the 4 county red and yellow zones
- Altamaha and Savanna-Upper Ogeechee Councils share an interest in the wise management of the Floridan Aquifer

Hilton Head/Savannah Model Grid (CSSI model)



Results of Salt Water Intrusion Modeling

- Reducing groundwater withdrawals from the aquifer, even by large amounts, would not eliminate salt water intrusion into the aquifer
- Groundwater withdrawals in both the Savannah area and on Hilton Head Island were needed to create the inland extent of the current salt water plume on Hilton Head Island
- Salt water plumes would continue to exist well into the future even if all groundwater withdrawals were eliminated

Combinations of Withdrawals That Do Not Cause the Plume to Move Further Inland

Sustainable Yield Depends on Where Pumping Occurs

Area Withdrawal (mgd)			Total Withdrawal (mgd)
Savannah	Yellow Zone	Hilton Head	
0.000	0.000	1.723	1.723
6.875	0.000	0.861	7.736
10.312	0.000	0.000	10.312
5.158	8.735	0.646	14.539
3.439	13.102	0.431	16.972
1.720	17.468	0.215	19.403
6.880	17.472	0.000	24.352
3.441	26.204	0.000	29.645
0.000	34.934	0.000	34.934

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Summary of EPD's Floridan Aquifer Groundwater Permit Limit Reduction Stakeholder Process

- Initiated in June 2014 and completed in June 2015
- Focused on achieving a16 MGD reduction in Floridan Aquifer permit limits in the Red and Yellow Zones
  - 15 MGD (~ 24%) in the Red Zone – 10 MGD by 2020 and 15 MGD by 2025
  - 1 MGD (~ 3.6%) in the Yellow Zone by 2025

Going Forward

- Developing alternate water supply strategies is vital to meet future needs

Red and Yellow Zone Forecasted Water Needs

Implement Proactive Local and Regional Planning

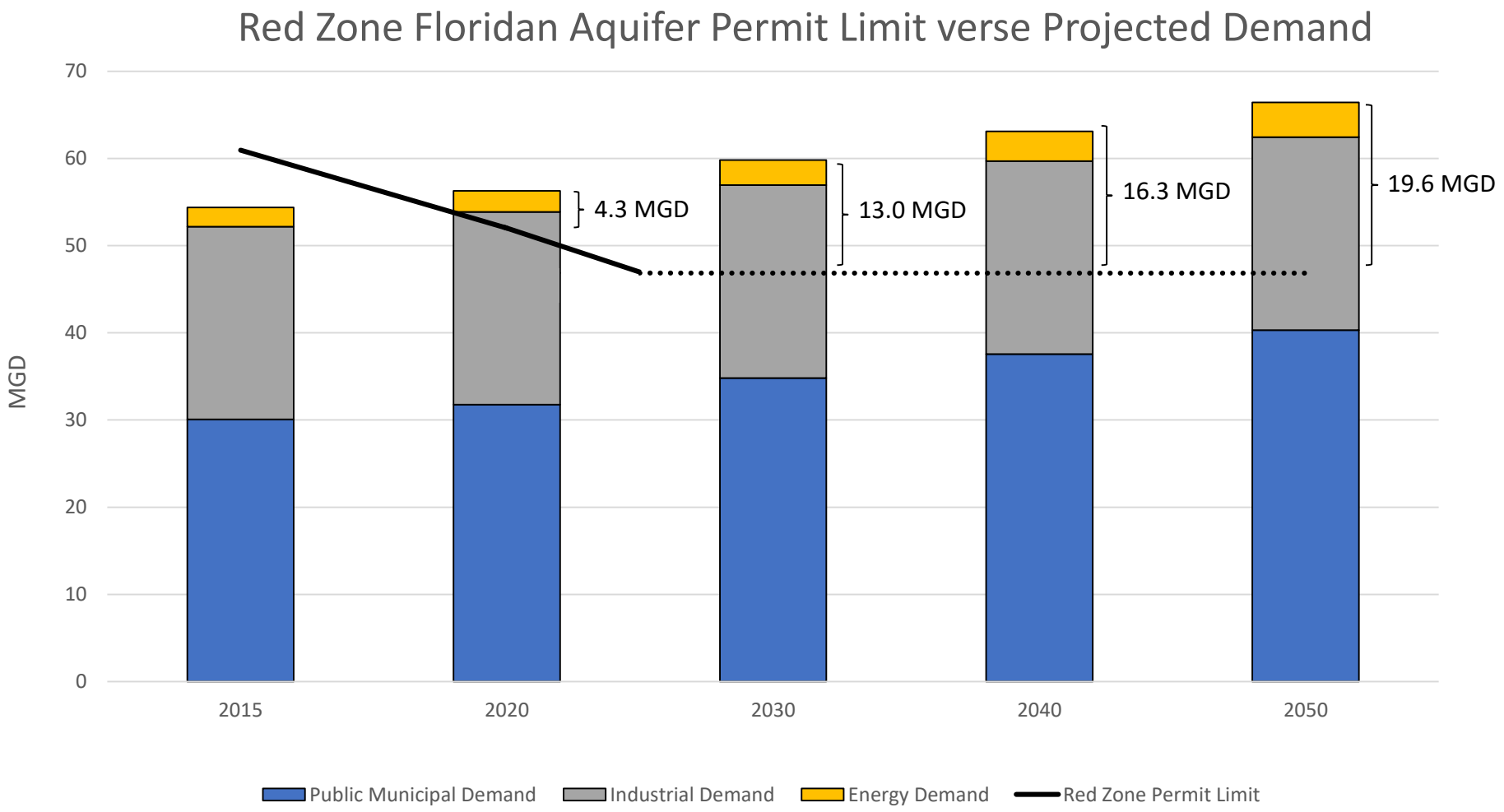
Reduction in Groundwater Use to Improve Management of the Floridan Aquifer

Implement Reduction Strategy

Groundwater Availability

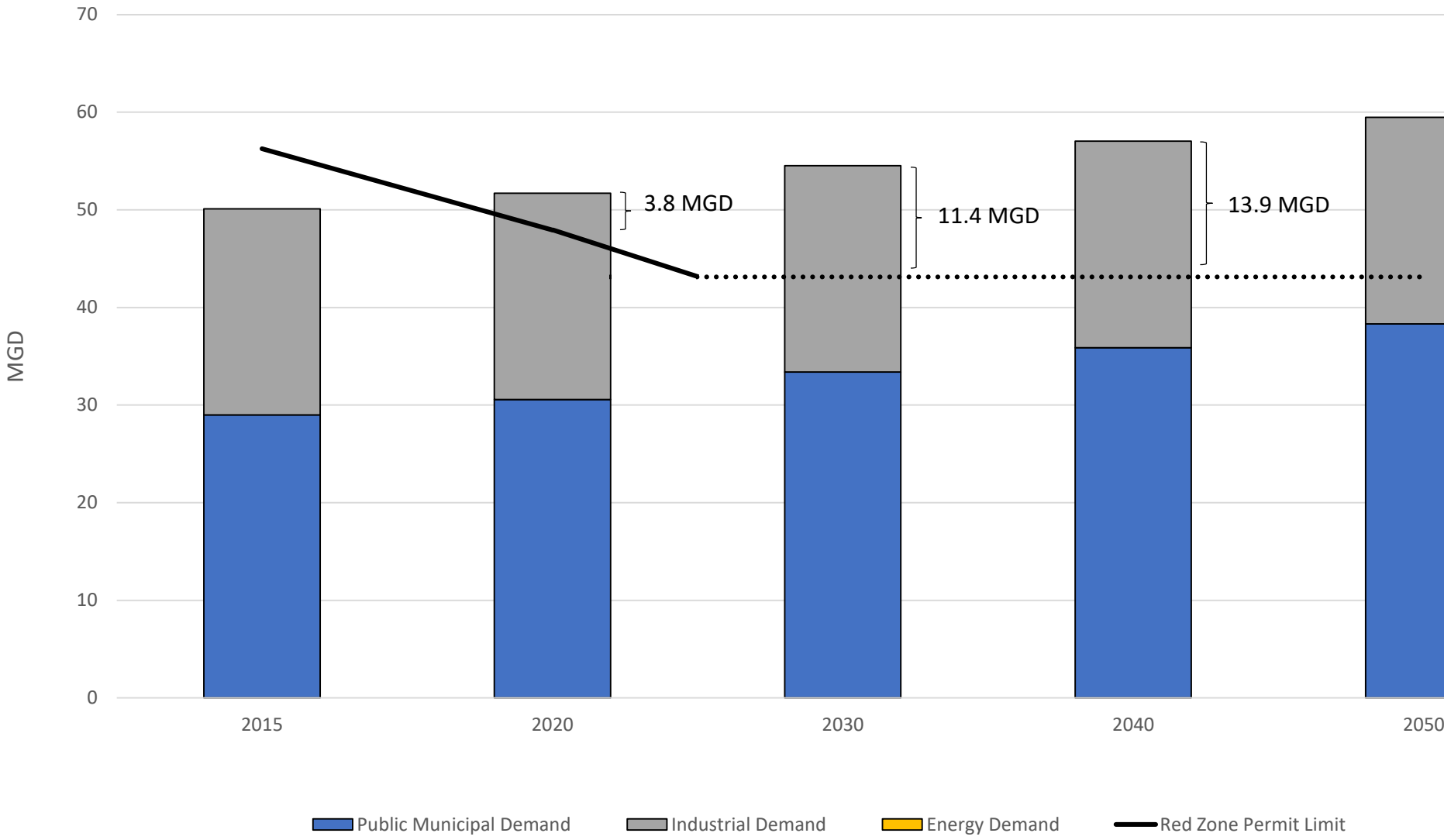
- Information should be considered preliminary draft and subject to change in coordination with Council and EPD

Aquifer Permit Limits vs. Projected Demand



Notes:
Fifty percent of the Effingham County municipal and industrial demands are assumed to come from the Red Zone.
Demand assumed to be supplied from the Brunswick aquifer has not been included (0.44 MGD in 2015; 0.53 MGD in 2050)

Chatham County Floridan Aquifer Permit Limit verse Projected Demand



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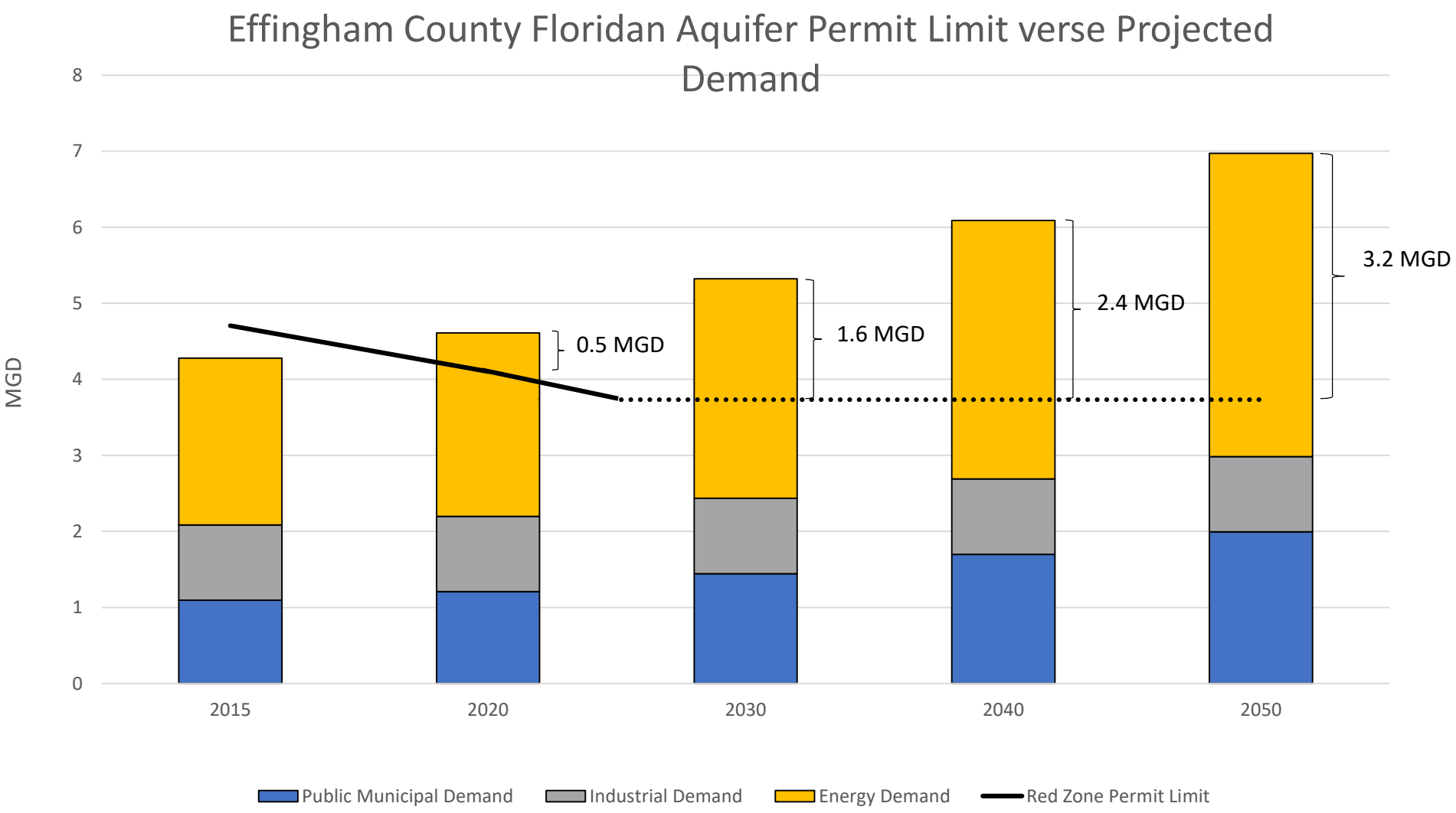

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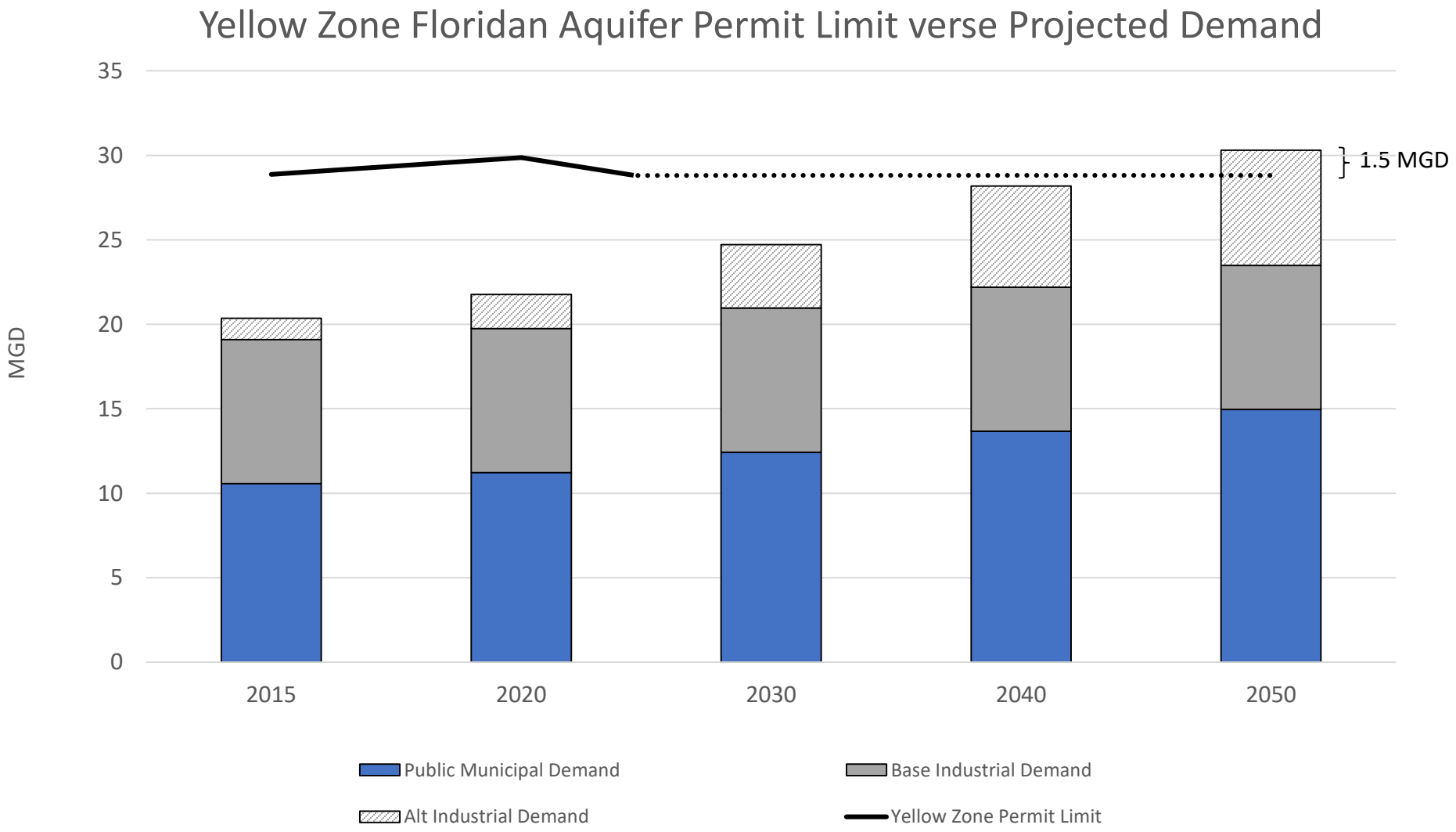

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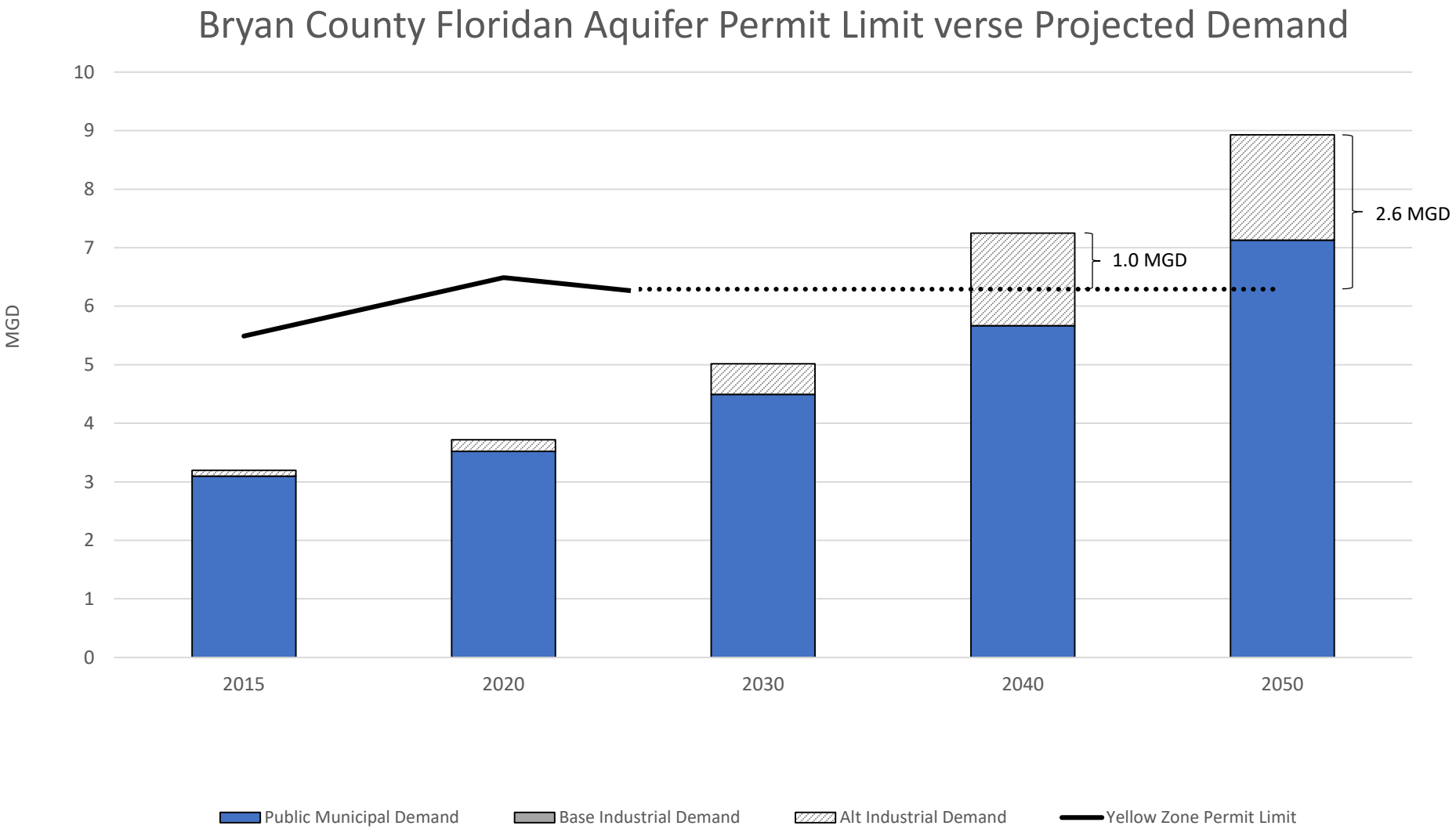

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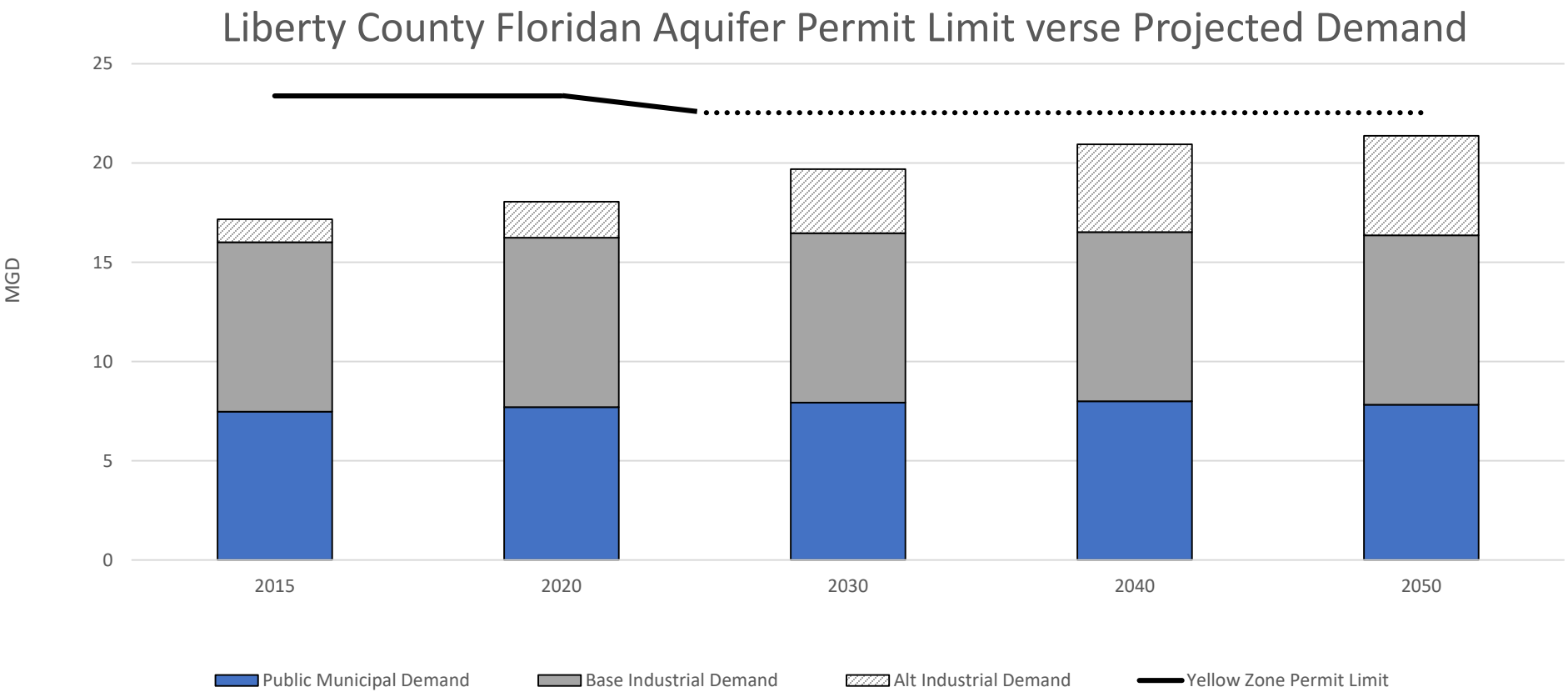
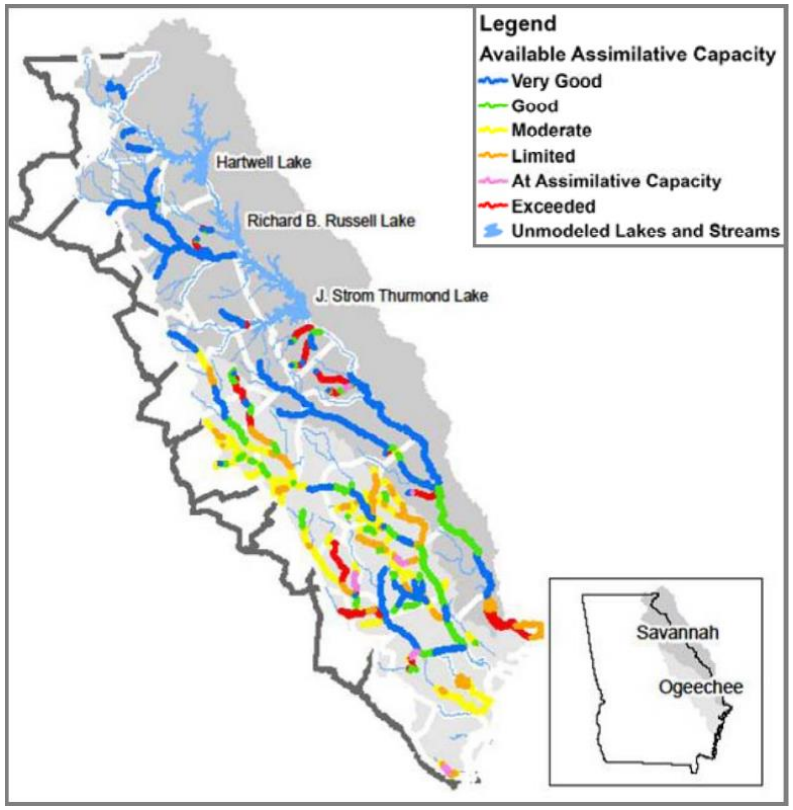


Surface Water Quality/Assimilative Capacity Gaps

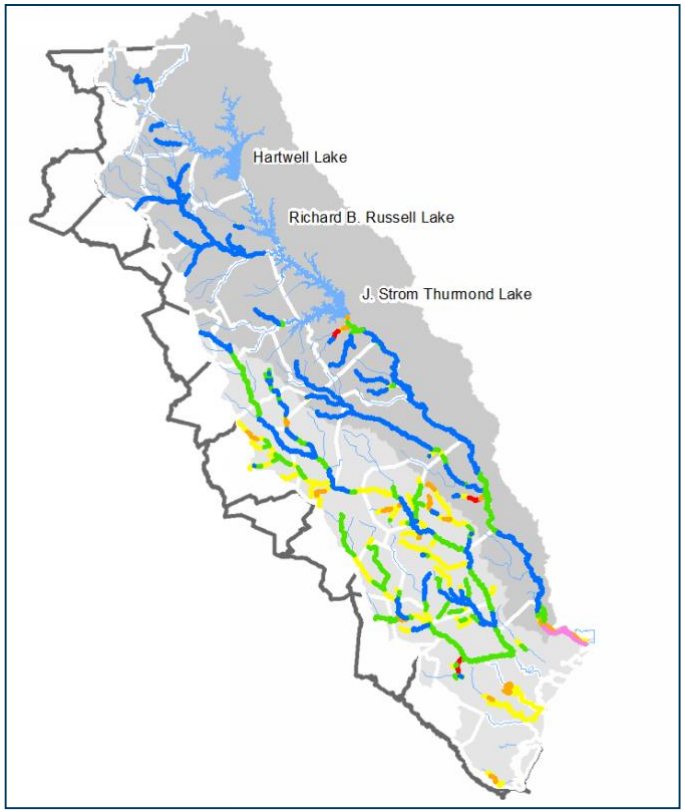
- Assimilative Capacity Assessment Round 2 Results
  - DOSAG & GA Estuary Models
  - 2000 thru 2012 (2012 is critical year)
  - Assimilative capacity for DO appears to be generally improving compared to Round 1
  - Will work with EPD to quantify and identify specific reaches that have limited or exceed the assimilative capacity within the Coastal Georgia Region

Surface Water Quality/Assimilative Capacity Gaps

- Coastal Georgia Region – Results of DO Assimilative Capacity



Round 1 Future Condition



Current Updated Future Condition (2050)

Legend
Avalable Assimilative Capacity
- Very Good ≥ 1 mg/L DO available
- Good 0.5 mg/L to < 1 mg/L DO available
- Moderate 0.2 mg/L to < 0.5 mg/L DO available
- Limited >0 mg/L to <0.2 mg/L DO available
- At Assimilative Capacity 0 mg/L DO available
- None or Exceeded < 0.0 mg/L DO available
- Unmodeled Lakes and Streams

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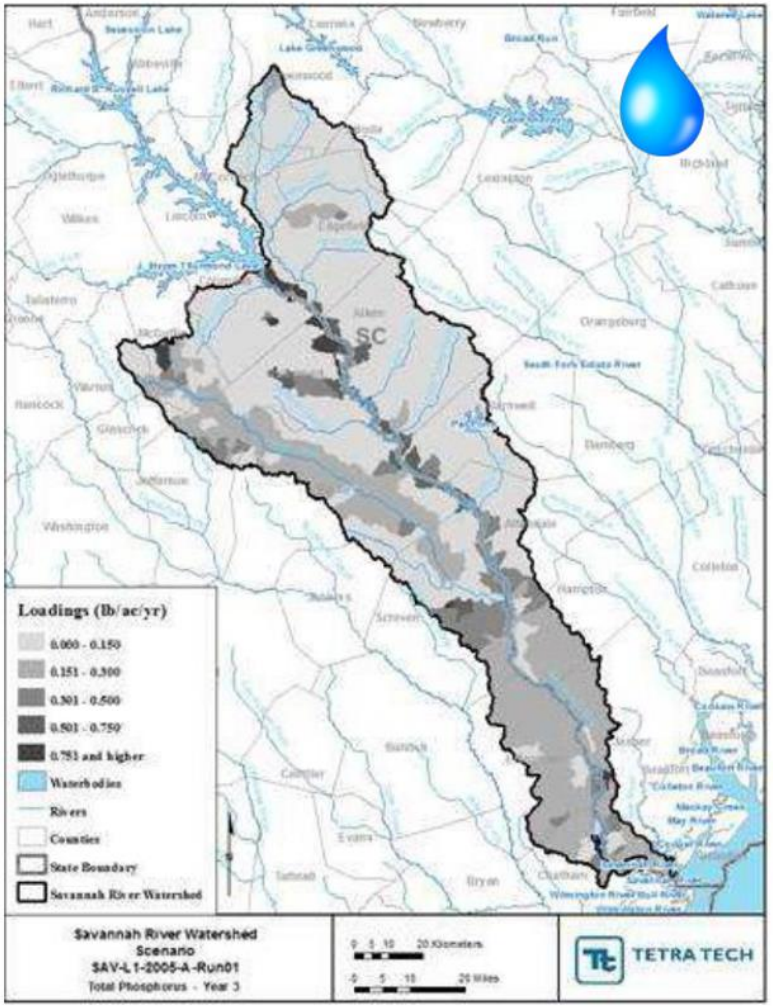
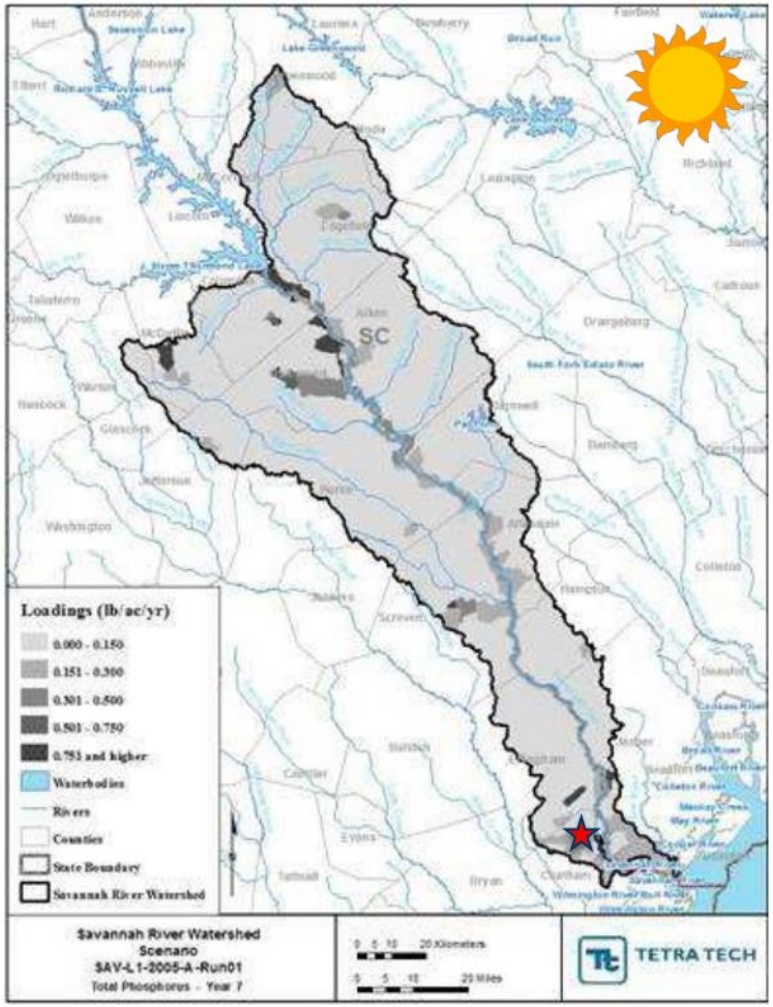
Surface Water Quality/Assimilative Capacity Gaps

- EPD also examined nutrient (TN and TP) loading in the region
  - Dry & Wet years
  - Areas of high loadings in dry years can indicate point sources as potential cause (i.e., wastewater discharge)
    - Chatham, Glynn, and Bryan Counties show highest forecasted increases in wastewater discharge
  - Areas of high loading in wet years are indicative on nonpoint source runoff
  - For nonpoint source loadings, Councils will want to re-visit their stormwater best management practices (BMPs)

Surface Water Quality/Assimilative Capacity Gaps

SAVANNAH TOTAL P HEAT MAPS





* Round 2 Current Conditions

★ **Denotes Counties with large forecasted increases (mgd) in wastewater discharge**

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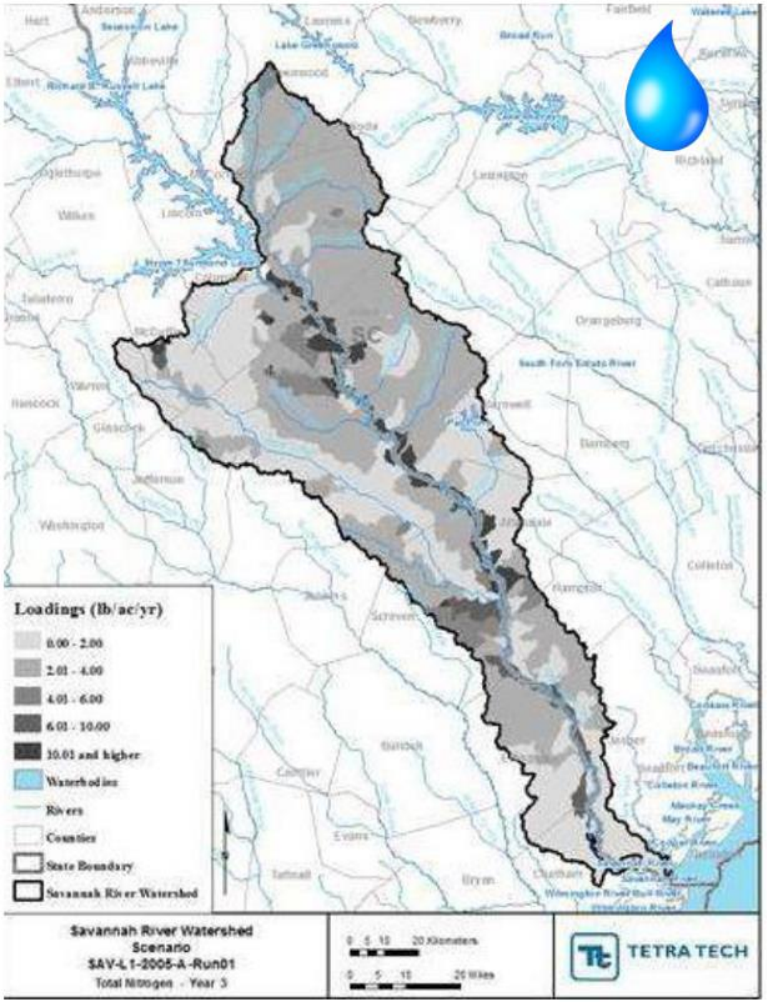
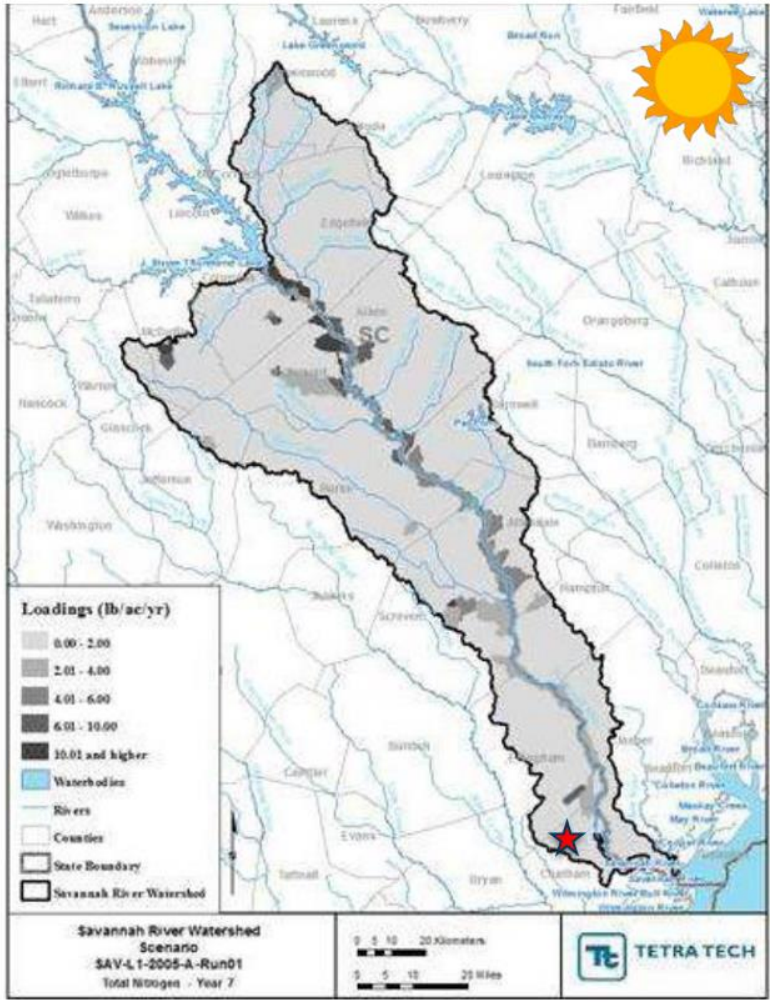
Surface Water Quality/Assimilative Capacity Gaps

SAVANNAH TOTAL N HEAT MAPS





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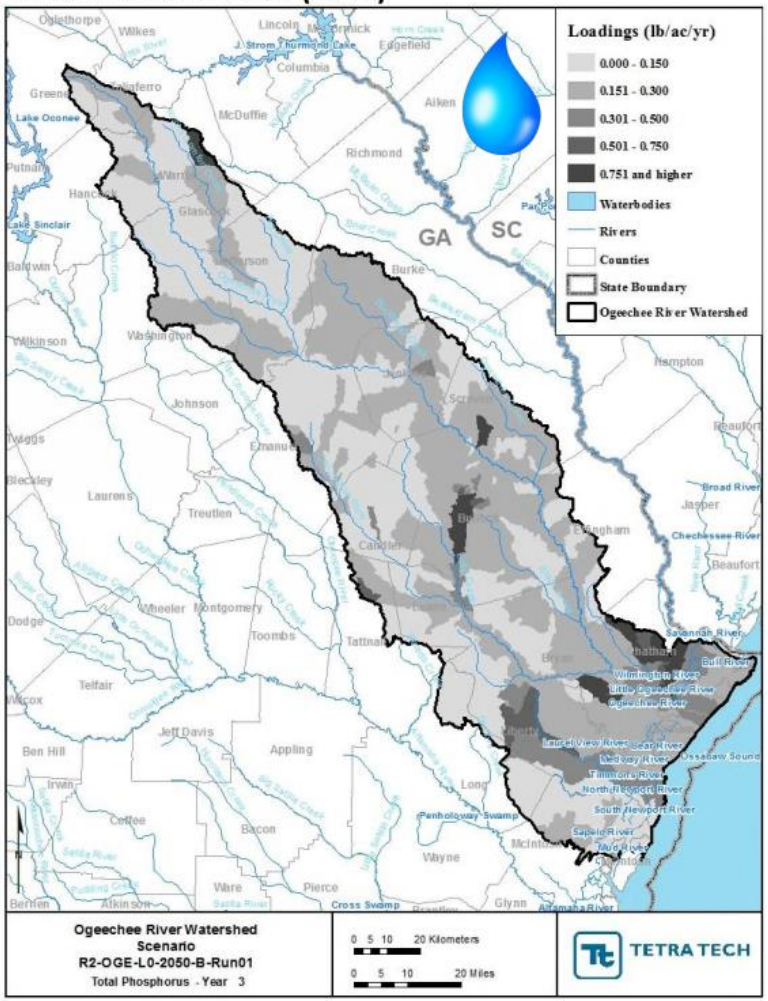
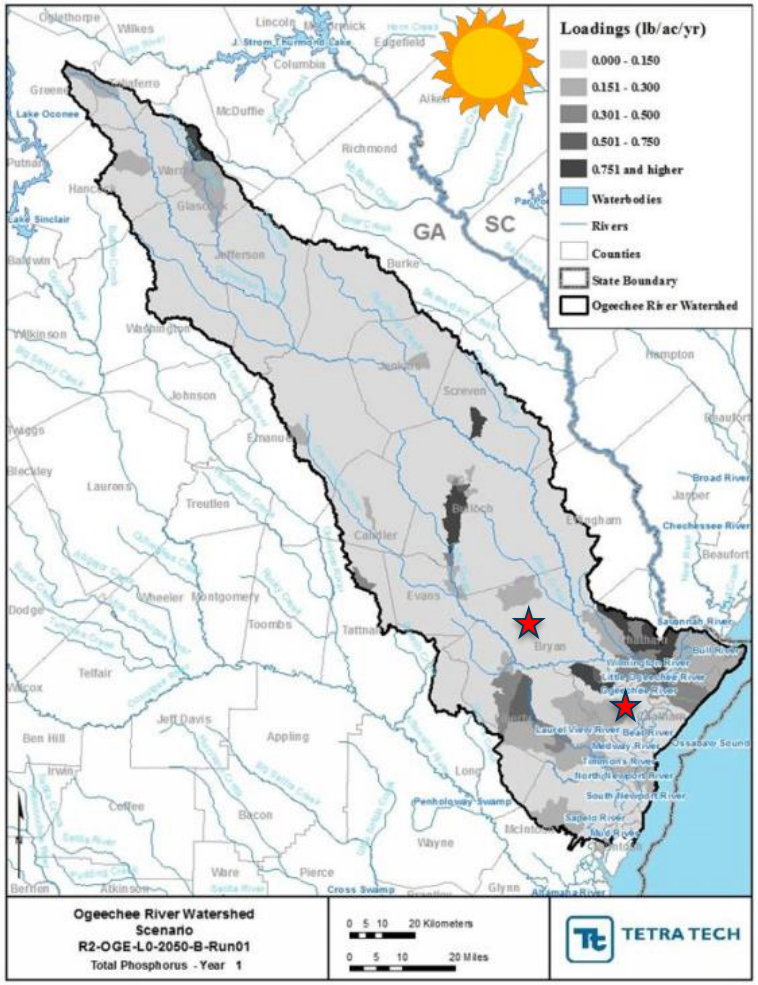
Surface Water Quality/Assimilative Capacity Gaps

OGEECHEE BASIN: TOTAL P "HEAT MAPS"

FUTURE CONDITIONS (2050)



FUTURE CONDITIONS (2050)



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Surface Water Quality/Assimilative Capacity Gaps

OGEECHEE BASIN: TOTAL N "HEAT MAPS"

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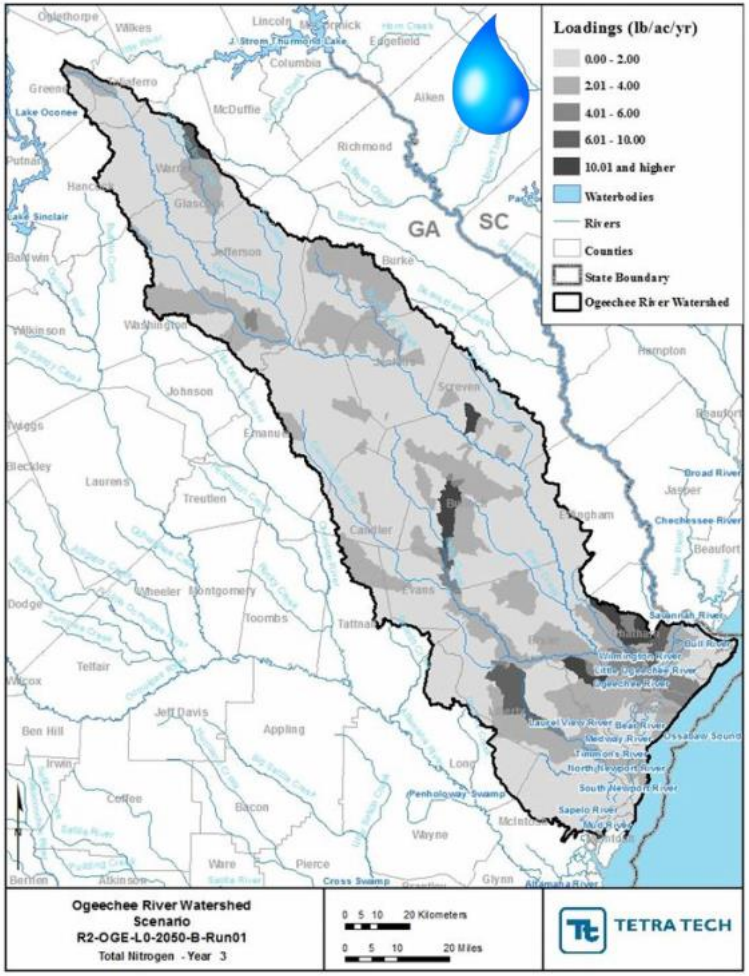

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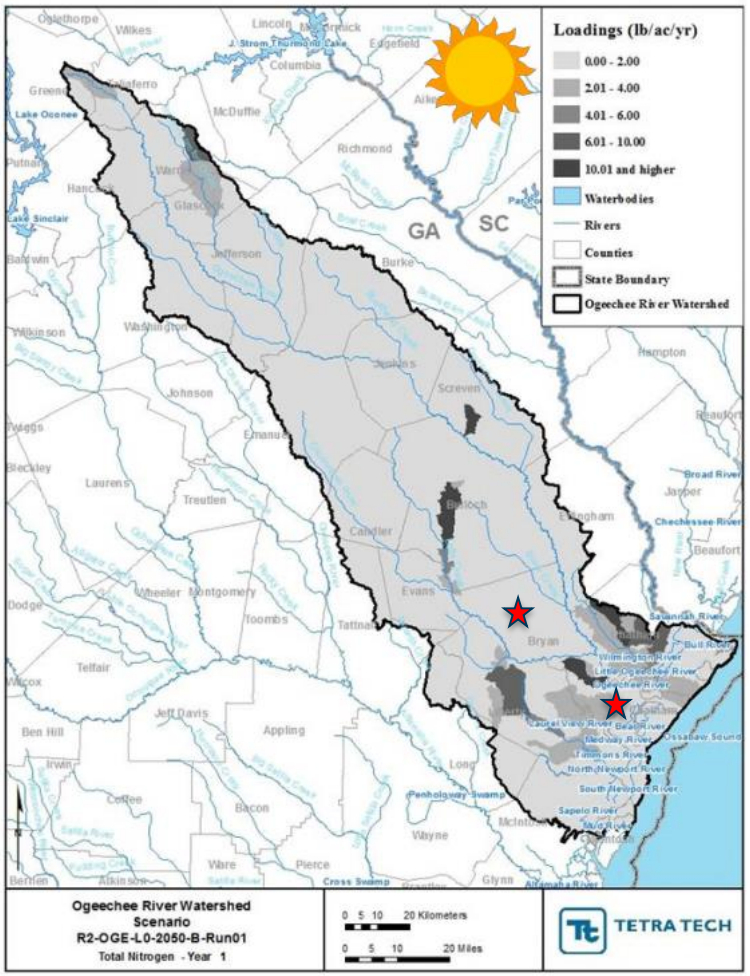

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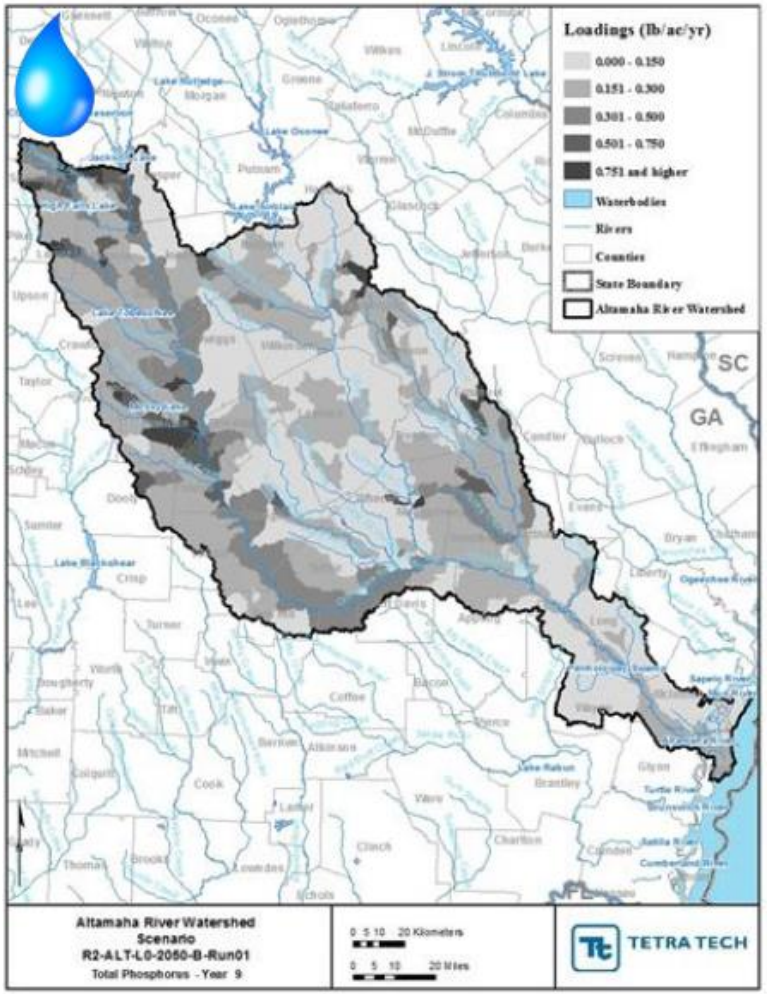
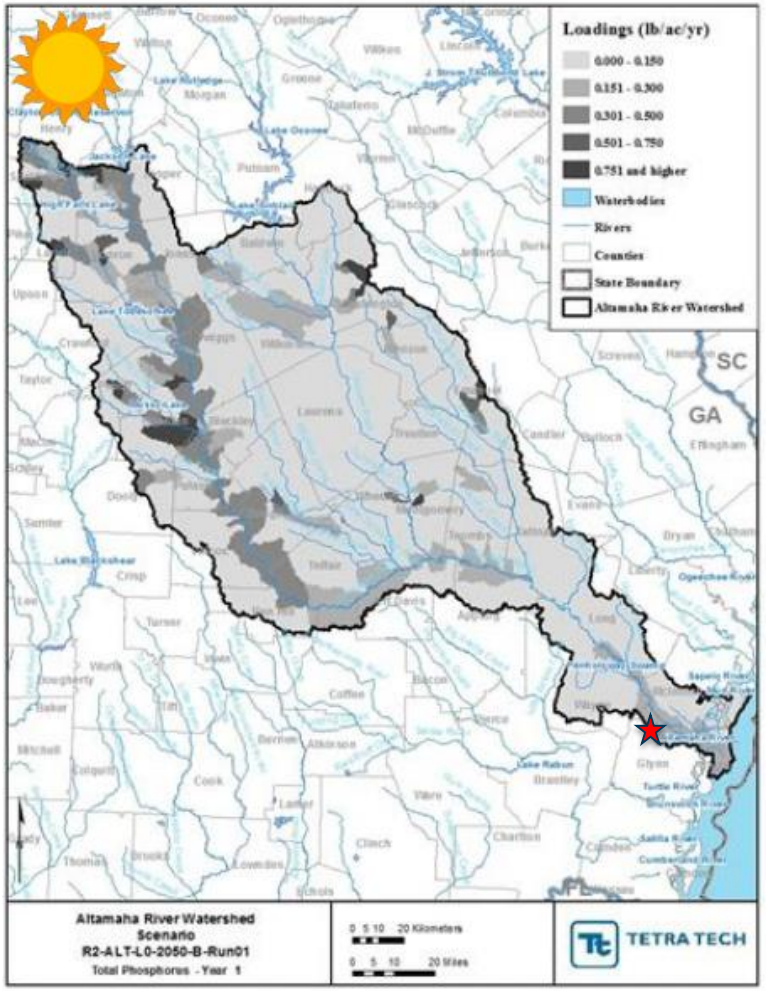
Surface Water Quality/Assimilative Capacity Gaps

ALTAMAHA BASIN: TOTAL P "HEAT MAPS"

FUTURE CONDITIONS (2050)



FUTURE CONDITIONS (2050)



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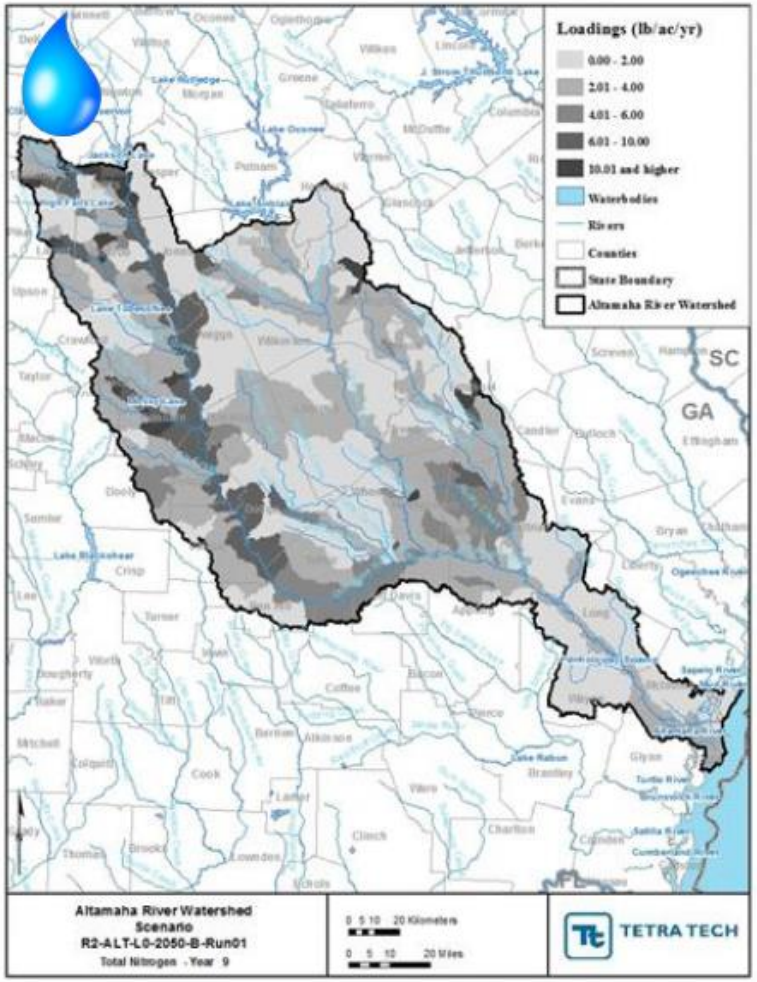
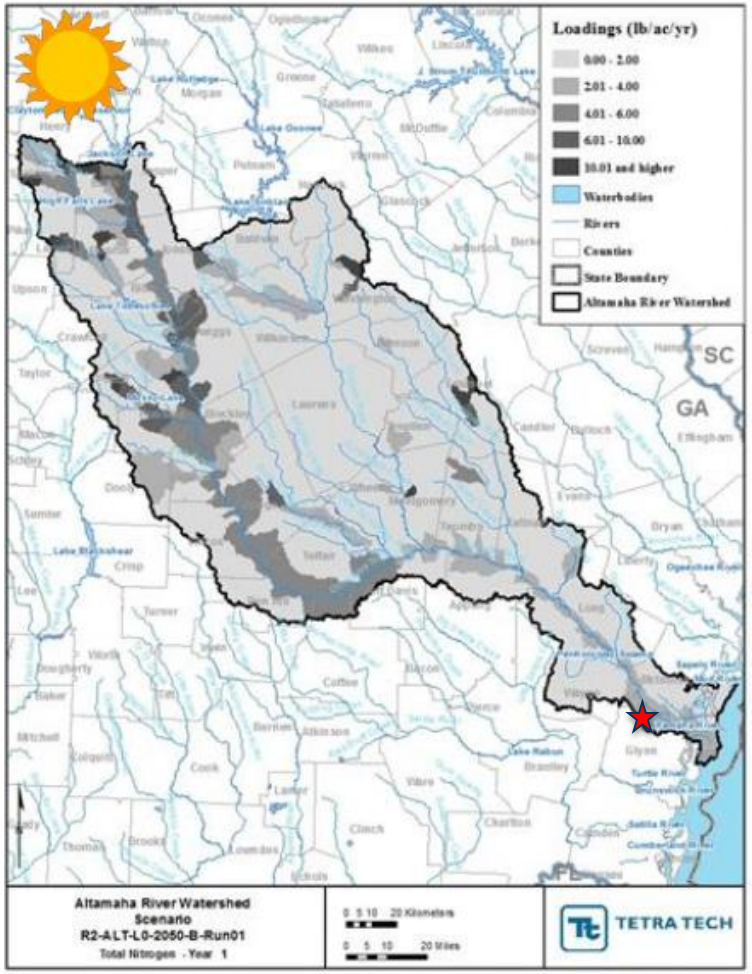
Surface Water Quality/Assimilative Capacity Gaps

ALTAMAHA BASIN: TOTAL N "HEAT MAPS"

FUTURE CONDITIONS (2050)



FUTURE CONDITIONS (2050)



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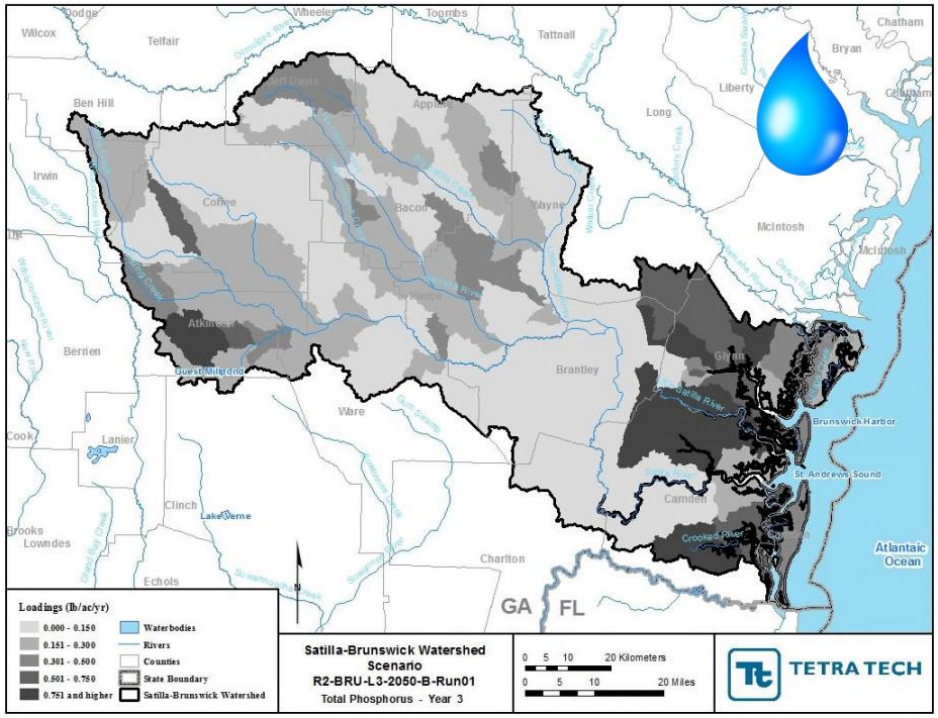
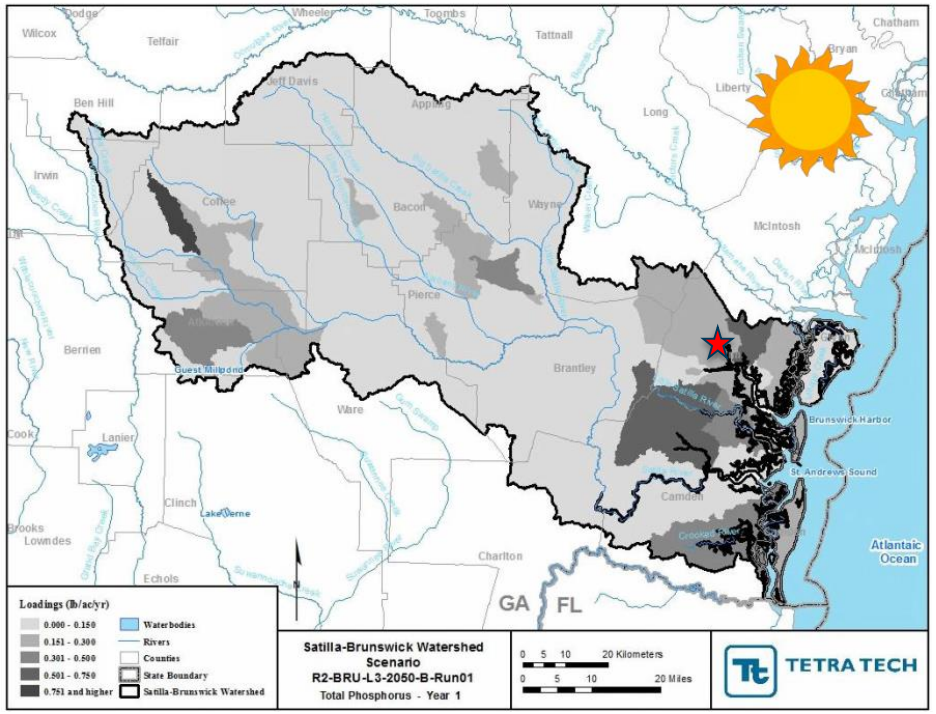
Surface Water Quality/Assimilative Capacity Gaps

SATILLA BASIN: TOTAL P "HEAT MAPS"

FUTURE CONDITIONS (2050)



FUTURE CONDITIONS (2050)



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Surface Water Quality/Assimilative Capacity Gaps

SATILLA BASIN: TOTAL N "HEAT MAPS"

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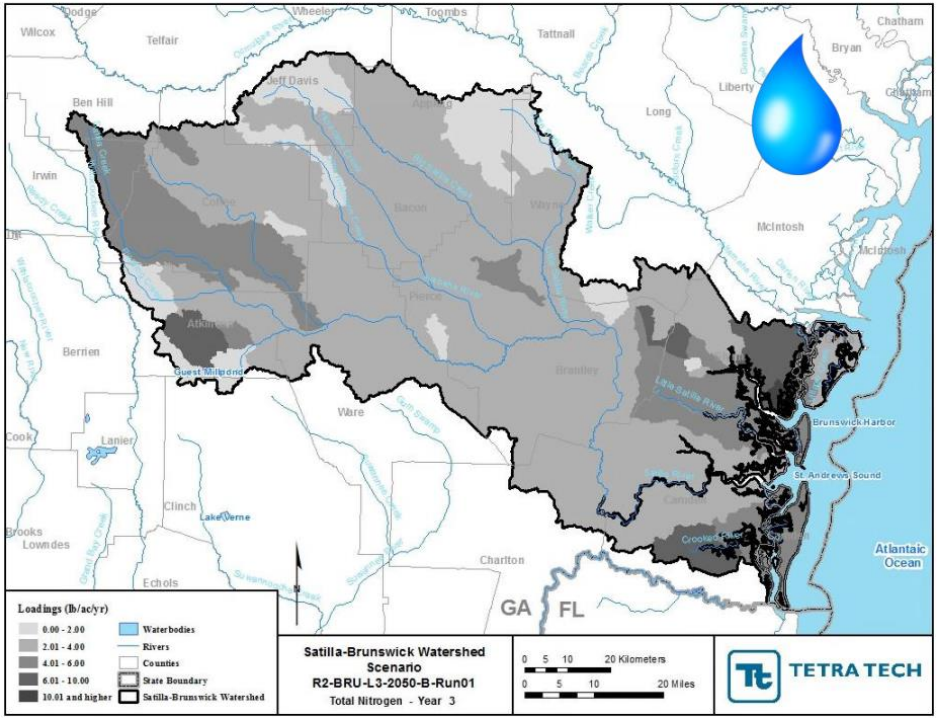

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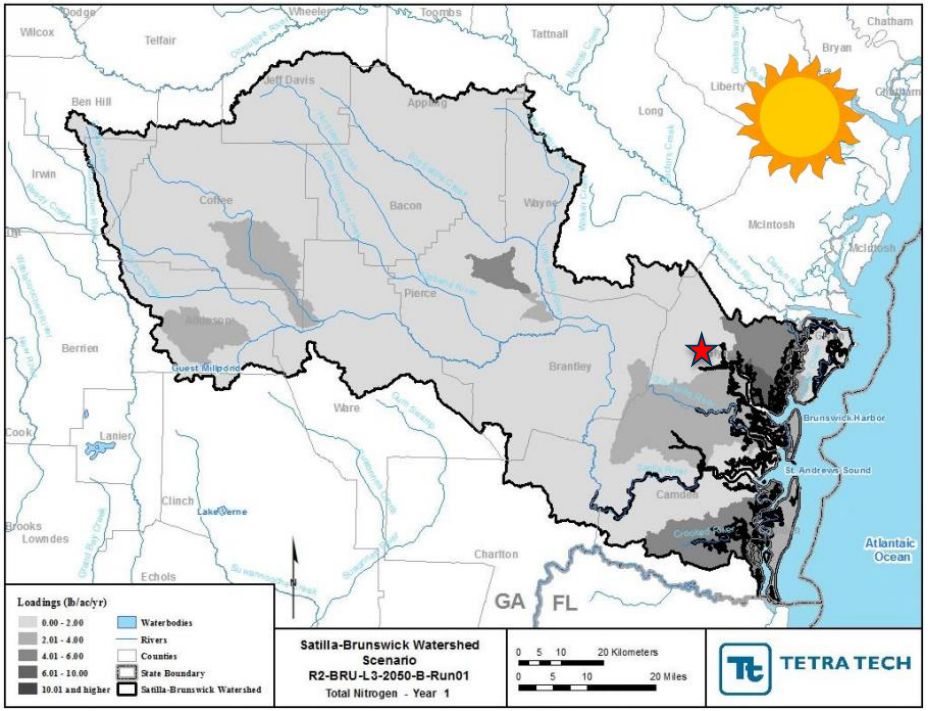

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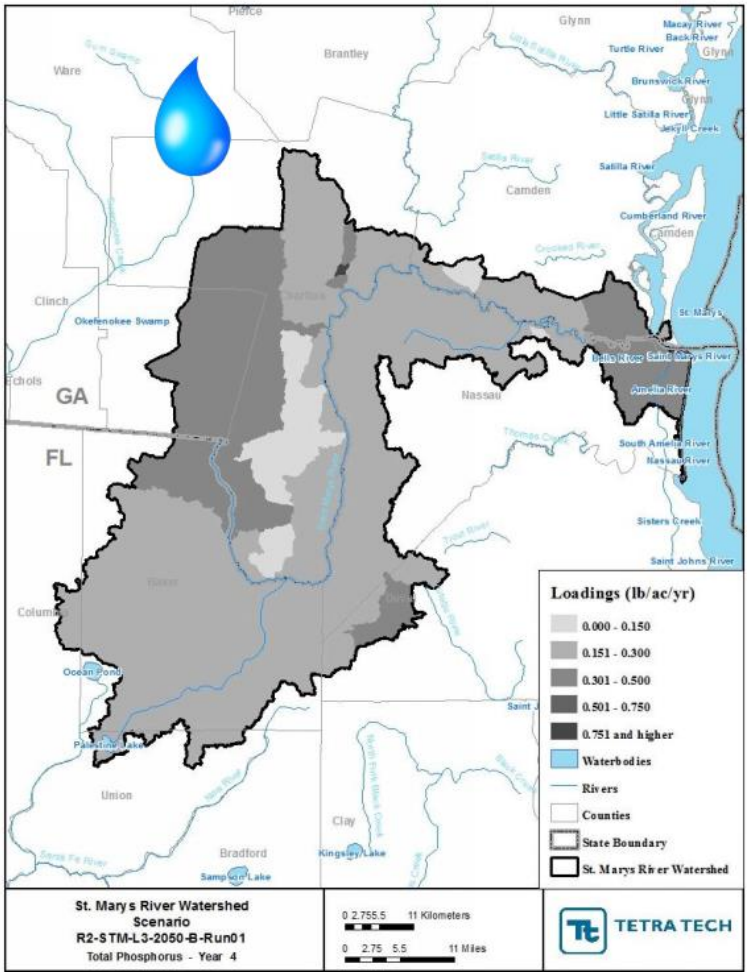
Surface Water Quality/Assimilative Capacity Gaps

ST. MARYS BASIN: TOTAL P "HEAT MAPS"

FUTURE CONDITIONS (2050)



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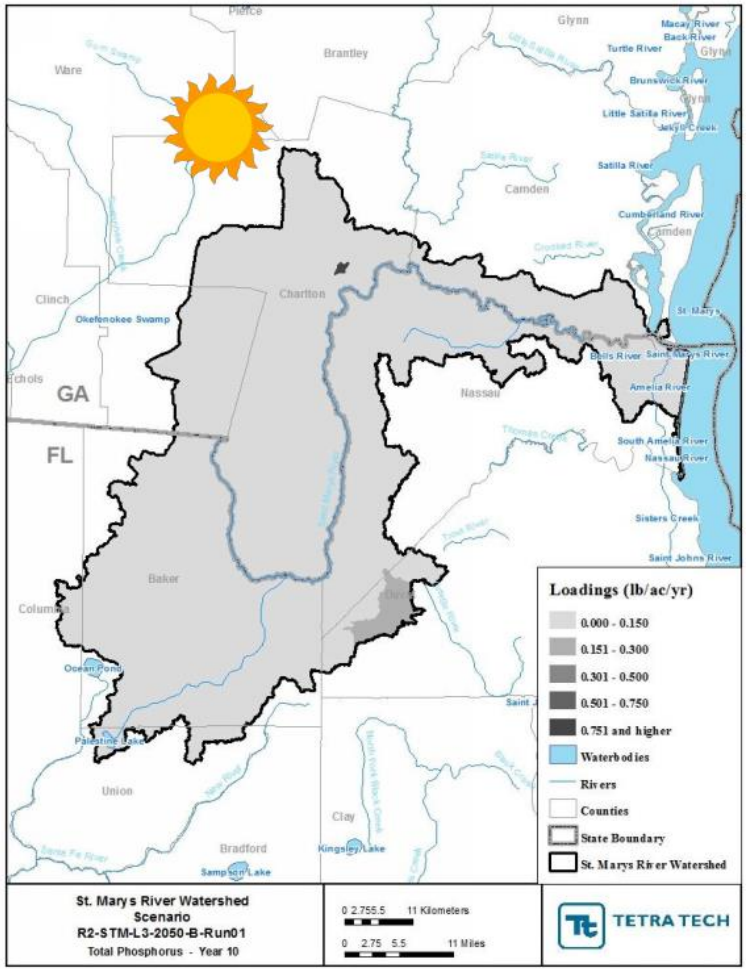

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Surface Water Quality/Assimilative Capacity Gaps

ST. MARYS BASIN: TOTAL N "HEAT MAPS"

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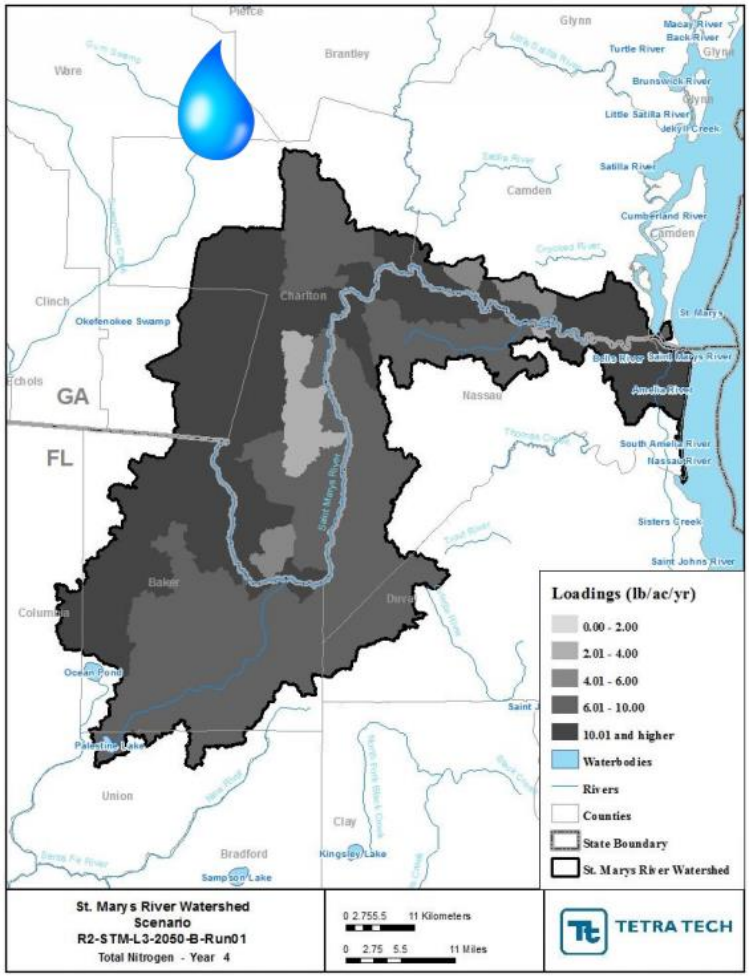

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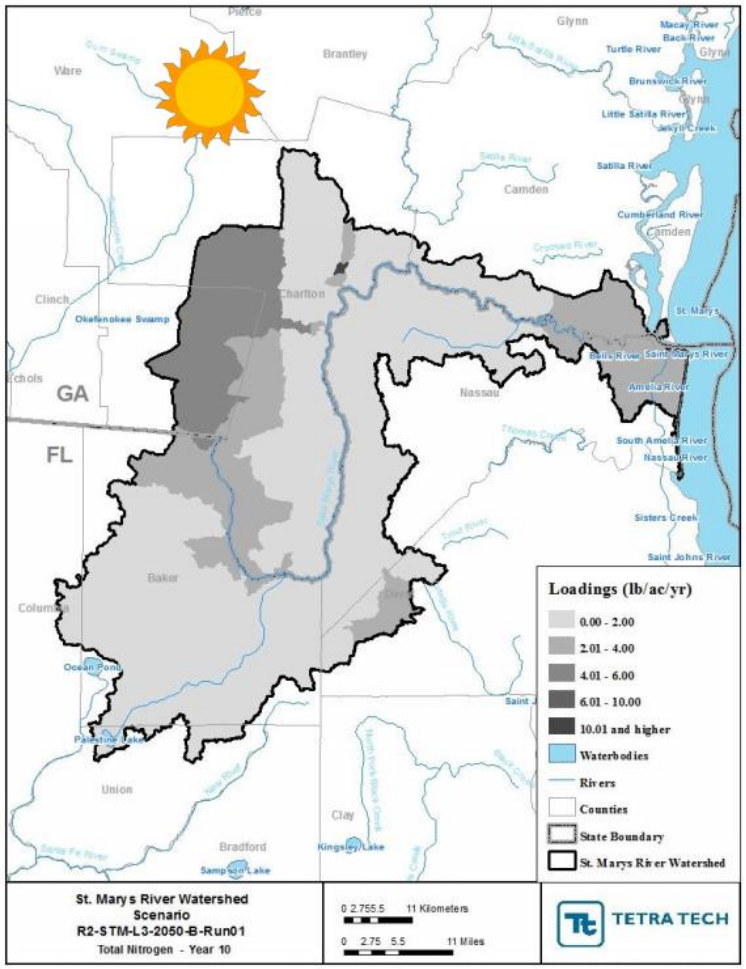

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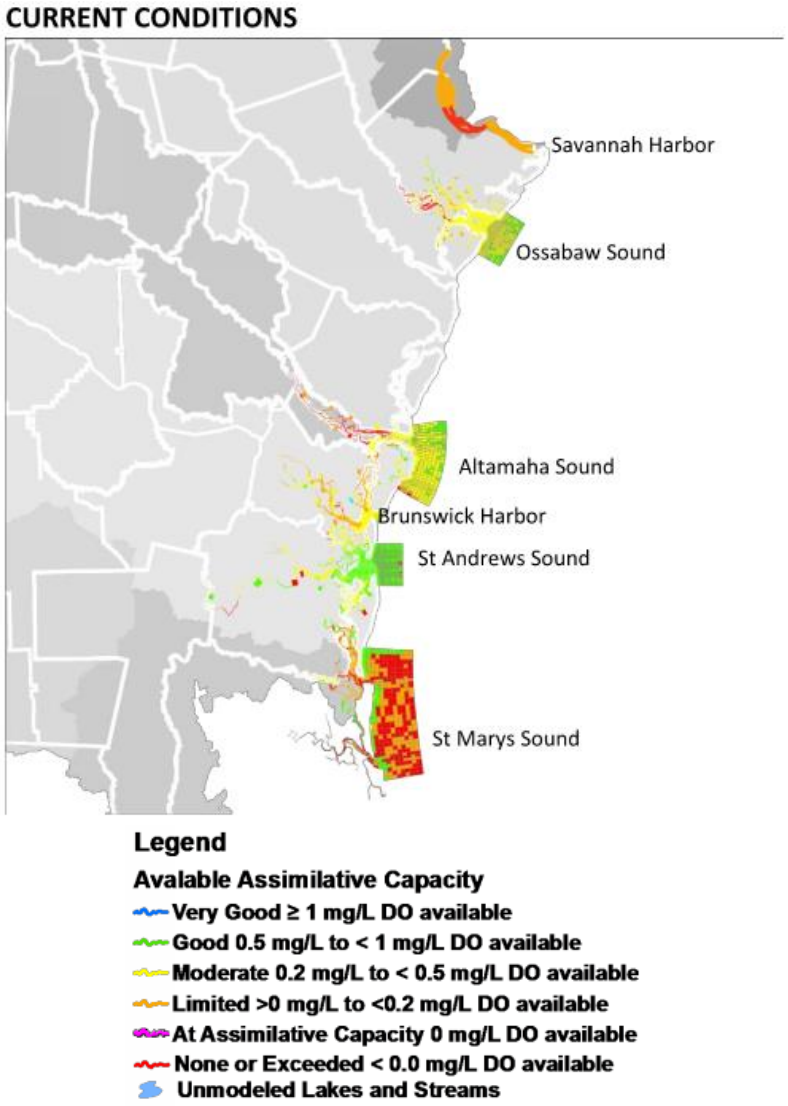
Surface Water Quality/Assimilative Capacity Gaps

- EFDC Lake & Estuary Model Results
  - Limited to no assimilative capacity in lower reaches of Altamaha River and Altamaha Sound
  - Lower assimilative capacity may be due to slower moving waters which contribute to naturally low DO levels



Georgia

Coastal Georgia Region Gap Summary

- Assimilative Capacity/Water Quality:
  - Assimilative capacity for DO appears to be generally improving compared to Round 1
  - Chatham, Effingham, and Glynn are the only counties with non-agricultural surface water use
    - Associated with Eden and Kings Ferry planning nodes with potential gaps
  - Areas of high loadings in dry years can indicate point sources as potential cause (i.e., wastewater discharge)
    - Bryan, Glynn, and Chatham Counties show highest forecasted increases in wastewater discharge
    - High TN and TP loading areas near Chatham & Glynn Counties
  - Areas of high loading in wet years are indicative on nonpoint source runoff
    - Re-visit BMPs for nonpoint source loadings

Georgia's

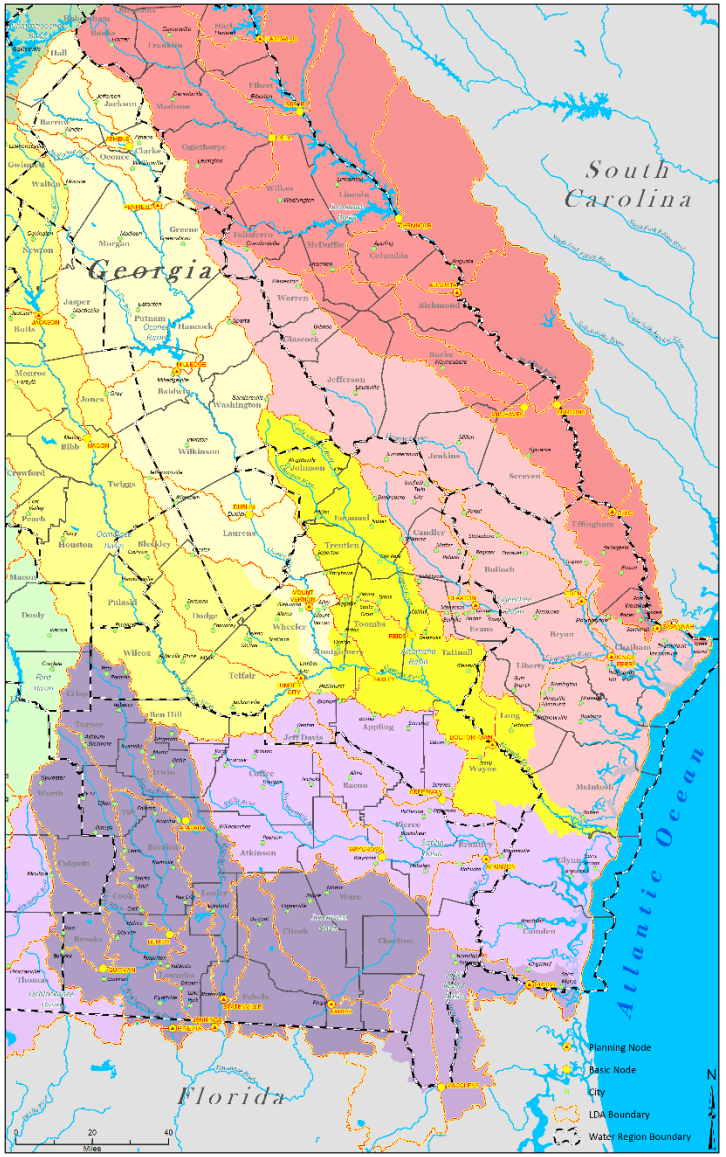
State Water Plan

Shared Resources

www.georgiawaterplanning.org

Shared Resources

- Surface Water
  - Addressing potential gaps will require evaluating surface water resource availability and demands at the watershed level
  - Council boundaries and demand forecast summaries are county based
  - GIS and other tools will allow a look at potential gaps from a watershed perspective using county based demand forecasts

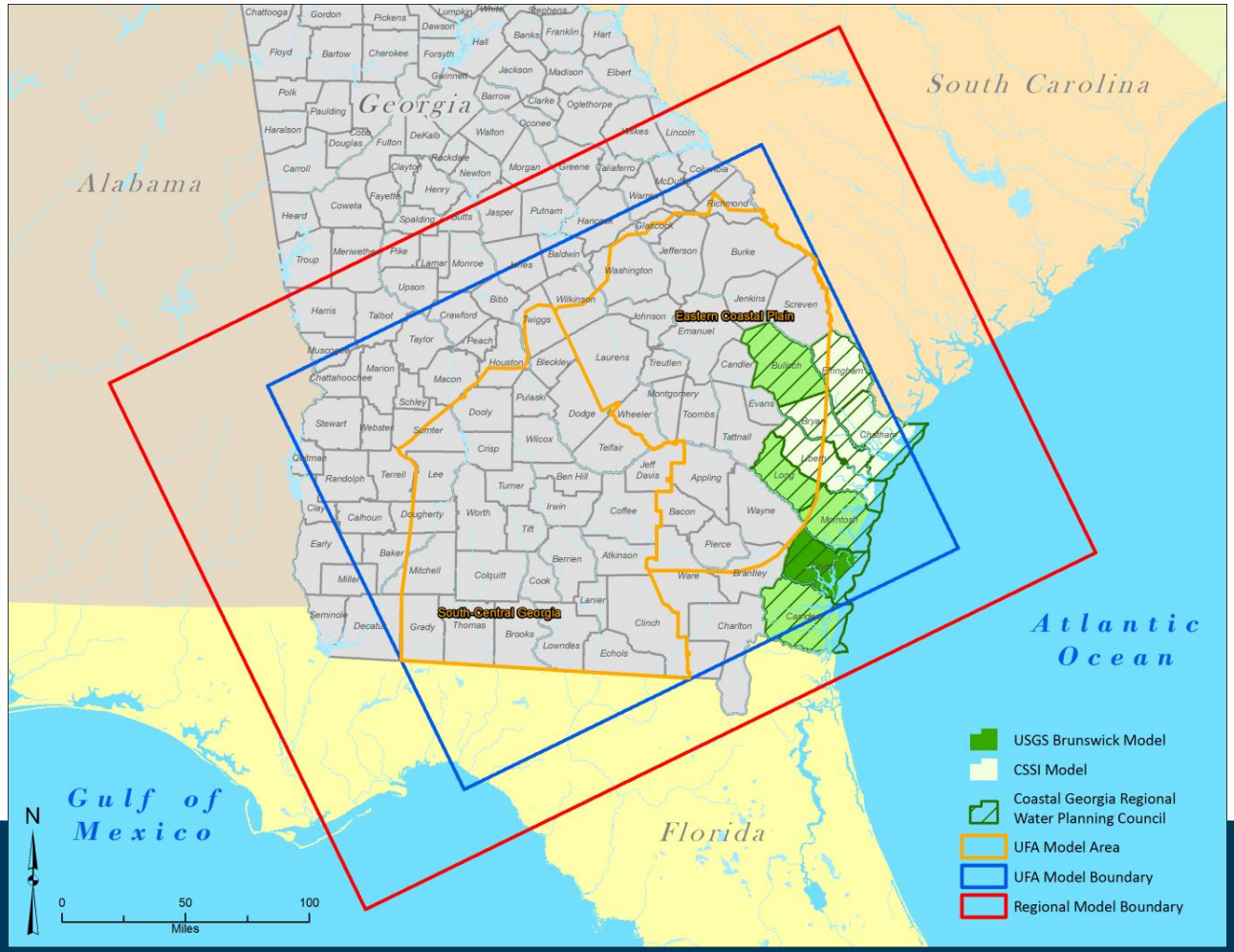


Shared Resources (Cont.)

- A closer look at spatial relationships of planning nodes, watershed (local drainage areas or LDAs), adjoining councils, and county locations

Shared Resources (Cont.)

- Groundwater – Floridan Aquifer model boundaries used for determining sustainable yield – this resource is utilized in multiple planning regions



Georgia's

State Water Plan

Management Practices

www.georgiawaterplanning.org

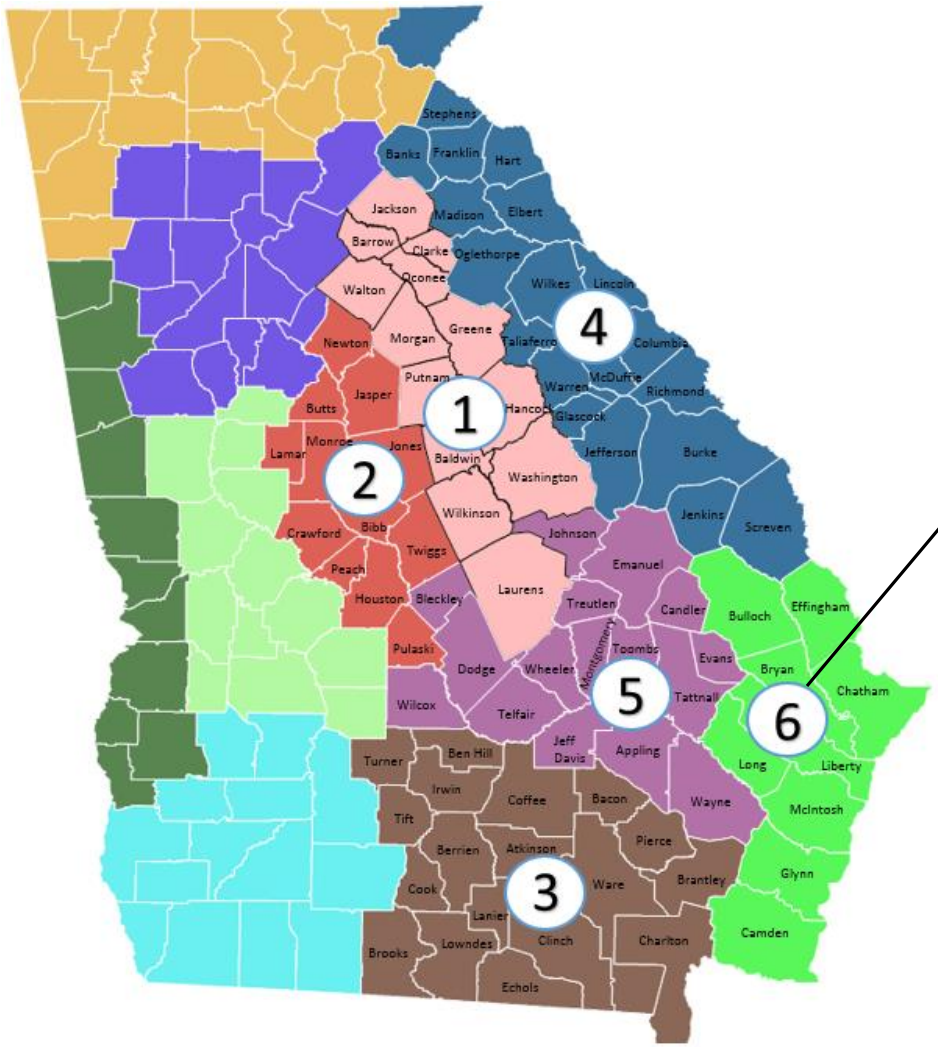
Management Practices Definition

- Any program or activity that:
  - Helps meet the regional vision and goals
  - Can be employed to ensure that there is sufficient water (surface and groundwater quantity) and assimilative capacity (surface water quality) to sustainably meet future needs
- Management practices can increase resource capacity and/or adjusts forecasted demands (i.e., water efficiency measures)

Coastal Georgia RWPC Vision

Conserve and manage our water resources in order to sustain and enhance our unique coastal environment and economy of Coastal Georgia.

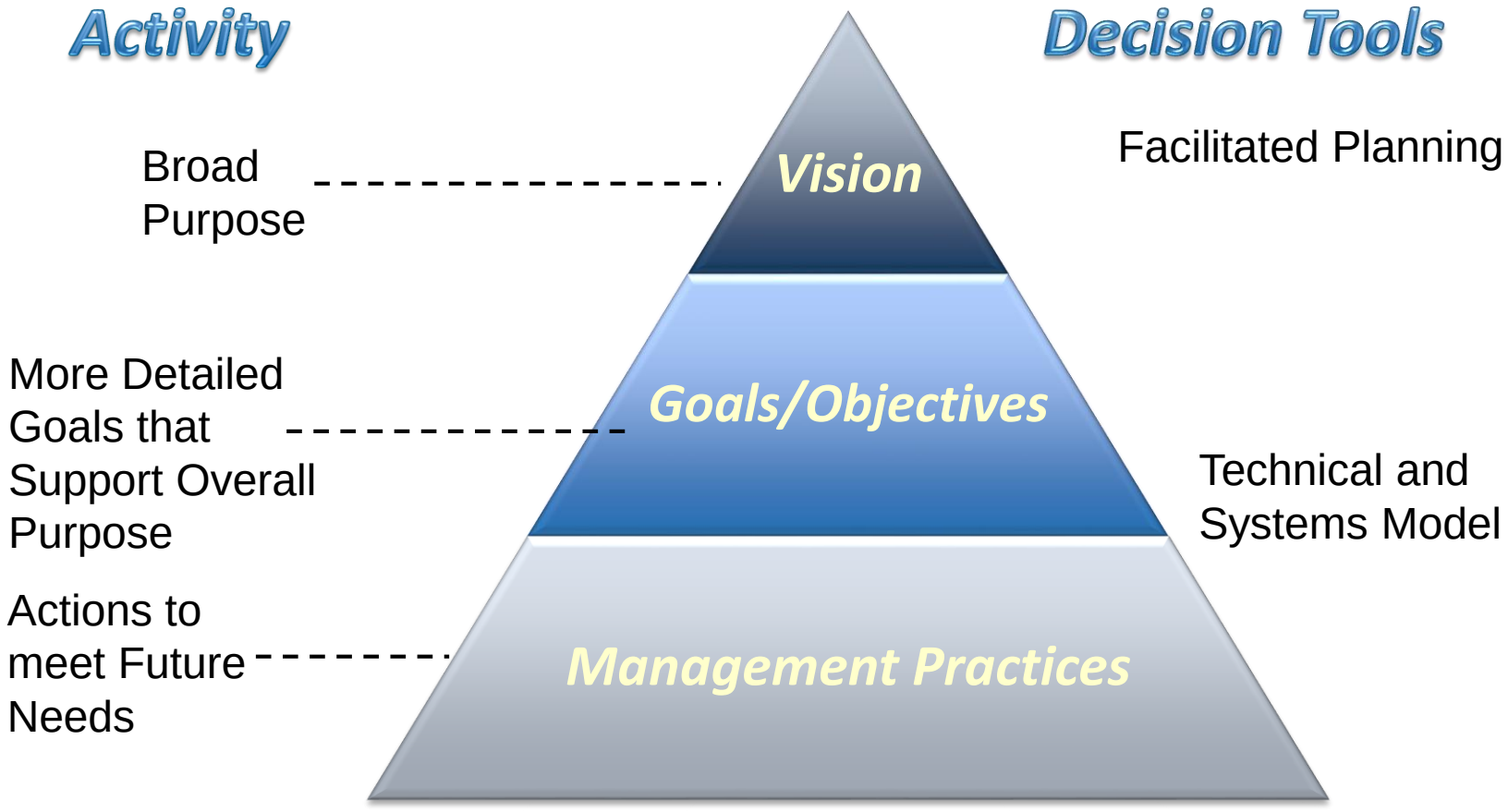
Coastal Georgia Water Planning Region Goals



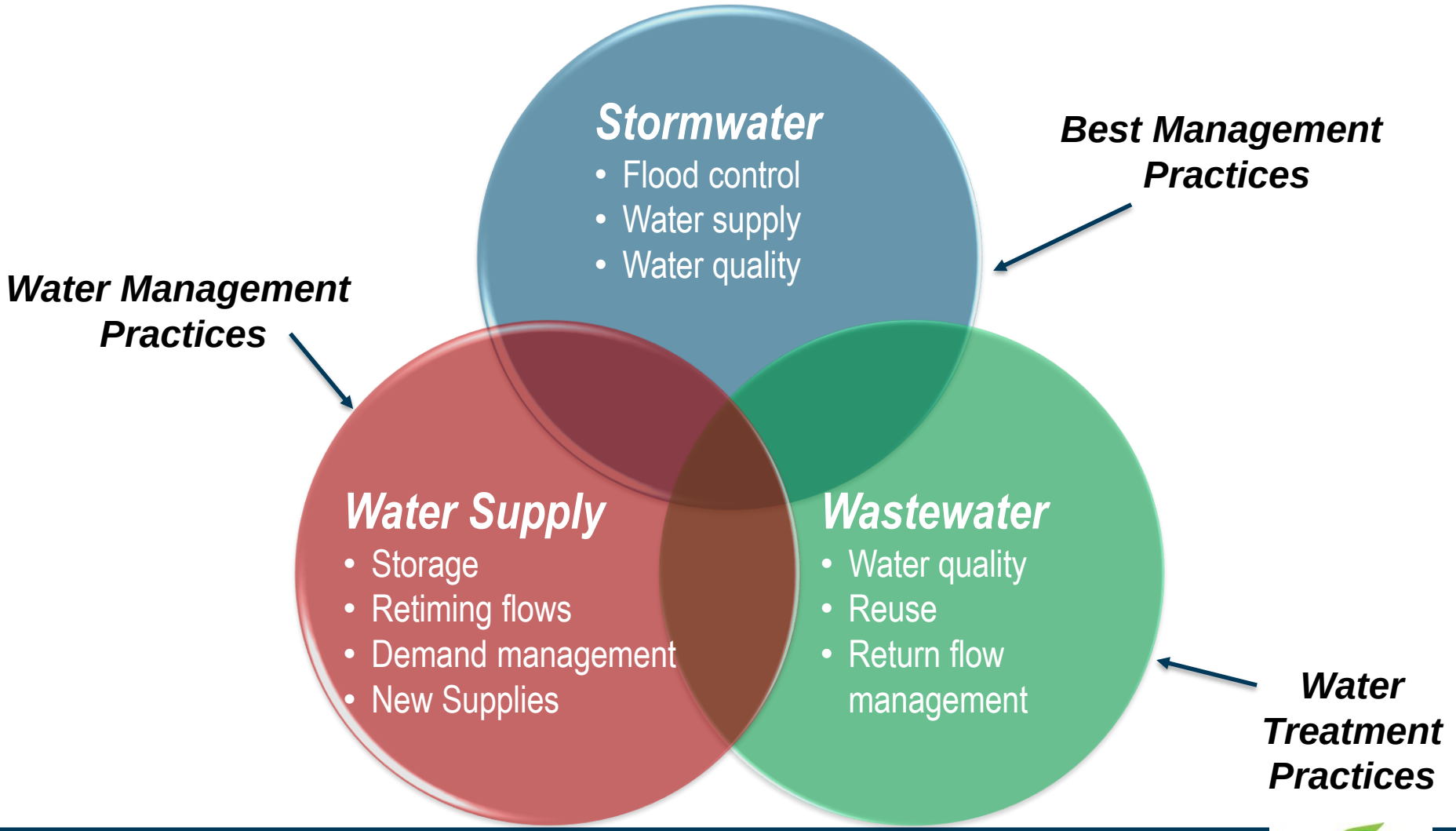
1. Manage and develop high quality water resources to sustainably and reliably meet domestic, commercial, industrial and agricultural water needs.
2. Identify fiscally responsible and implementable opportunities to maximize existing and future supplies including promoting water conservation and reuse.
3. Optimize existing water and wastewater infrastructure, including identifying opportunities to implement regional water and wastewater facilities.
4. Protect and maintain regional recreation, ecosystems, and cultural and historic resources that are water dependent to enhance the quality of life of our current and future citizens, and help support tourism and commercial activities.
5. Identify and utilize best available science and data and apply principles of various scientific disciplines when making water resource management decisions.
6. Identify opportunities to manage stormwater to improve water quantity and quality, while providing for wise land management, wetland protection, and wildlife sustainability.

Georgia

Developing a Water Plan Decision Framework



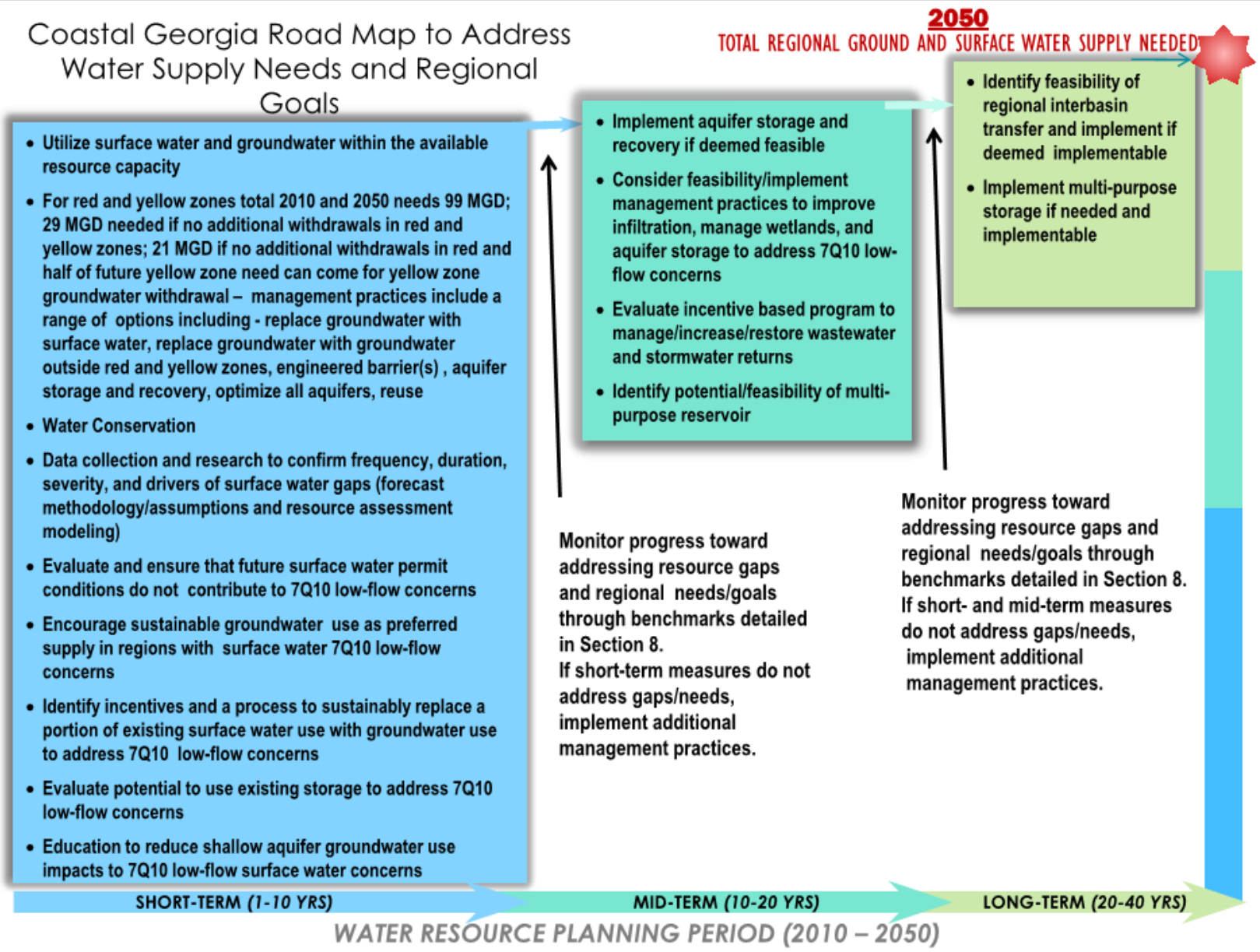
Developing a Water Plan Decision Framework



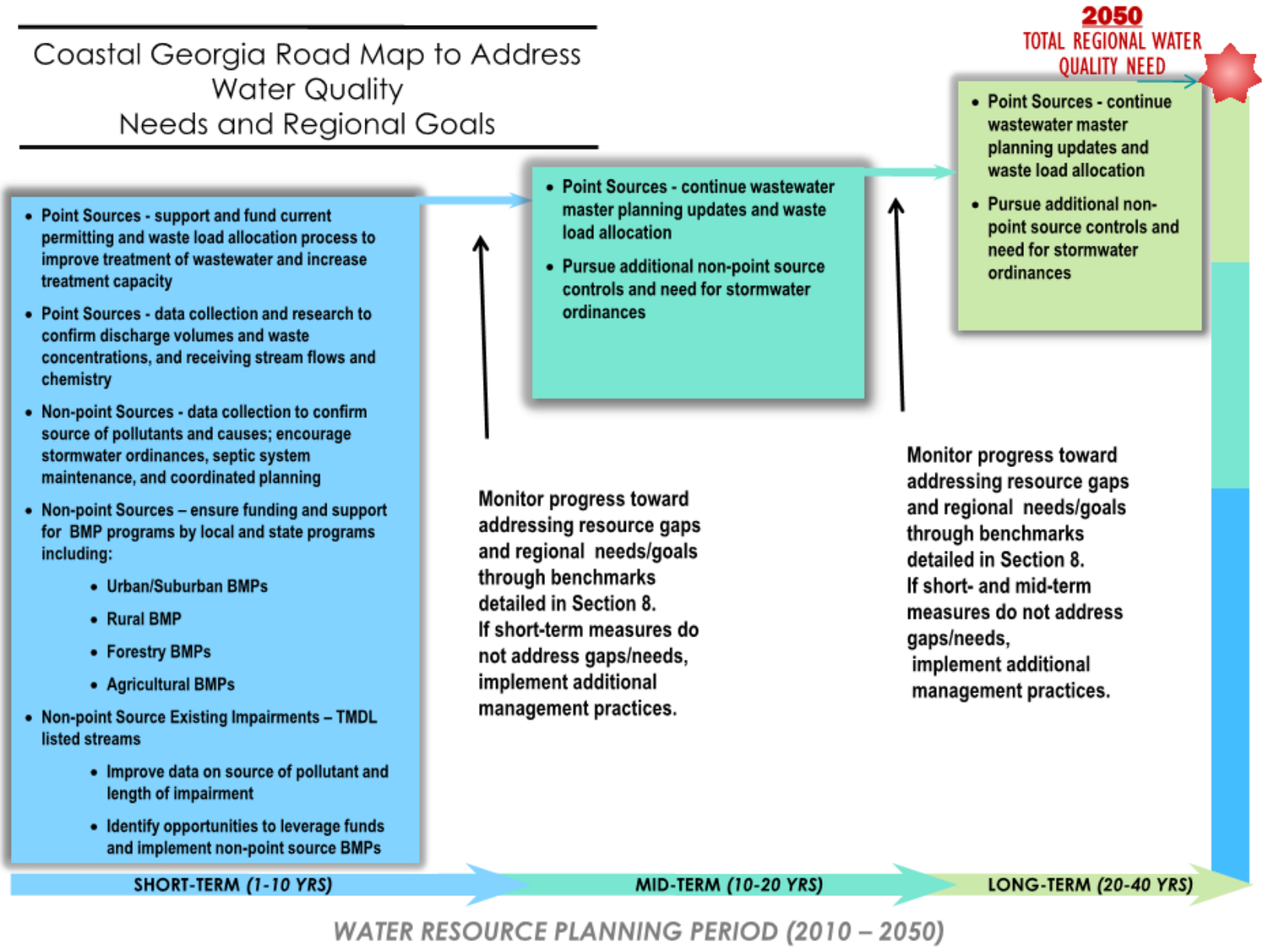
Management Practices

- The Coastal Council identified 86 Management Practices in 2011 RWP
  - Water Conservation
  - Water Supply and Management
  - Wastewater and Water Quality
  - Information Needs
- The following two slides are from the 2011 Plan and provide a high level overview of the identified management practices

2011 RWP Recommended Management Practices

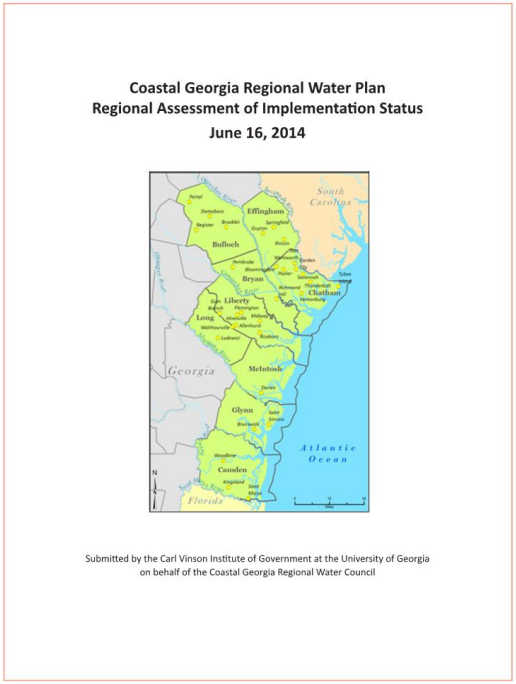


2011 RWP Recommended Management Practices



Interim Planning Period

- Regional Assessment of Implementation Status Report (2014)
- Many accomplishments achieved in the Coastal Georgia region in the areas of:
  - Water Demand Management/ Water Supply
  - Water Quality
  - Stormwater
  - Data and Information Needs



Lessons Learned - Permit Reduction Stakeholder Process

- Meeting 1 - Identified Purpose of the Leadership Group and Permit Limit Reduction Targets
- Meeting 2 – Developed initial "universe" of options:
  - Reduced 18 Options to 9 Options
  - Further reduced to 4 Options
- Subcommittees formed to further delineated options
  1. Demand Management/Water Conservation
  2. Additional Use of Surface Water Using Existing Infrastructure
  3. Mathematical Formula
  4. Financial Incentive Concepts

Georgia

Lessons Learned - Permit Reduction Stakeholder Process

- Water Conservation Option
  - Establish 2 Subcommittees – 1 Municipal and 1 Industrial - to develop proposed reduction volumes to apply toward reduction targets
- Surface Water Option(s)
  - Identify entities that could connect to existing water system(s)
  - Identify entities that would consider developing additional surface water supplies with existing surface water permits and/or new surface water permits
  - Gather preliminary cost information from existing water system(s) based on a range of "contracted/delivered" water
- Mathematical/Formula Focused
- Groundwater Option(s)
- Financial Option(s)

Lessons Learned - Permit Reduction Stakeholder Process

- The Savannah Industrial and Domestic (I&D) Treatment Plant has 28.5 MGD of potentially available surface water supply
  - 62.5 MGD capacity and 32-34 MGD of current demands
- Many municipal and industrial entities can readily physically obtain I&D water
- The cost differential between surface and groundwater, as well as local control concerns, were challenging issues
- Discussion over increased reliance on a "single" surface water source

Photo from HGDB Website

Management Practices – Next Steps in the Plan Update

- Based on updated forecasts and demands:
  - Are there additional practices not currently in plan?
  - Are there ones that should be refined?
  - Ones that should be eliminated?

Thank You!

Questions? Comments? Need More Information?

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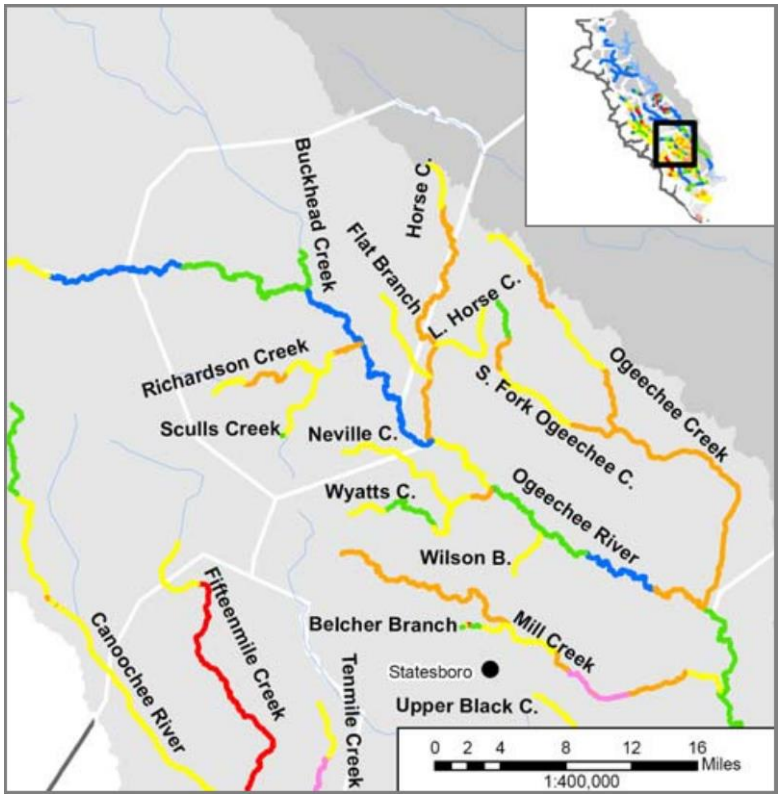
brownrl1959@gmail.com

Georgia

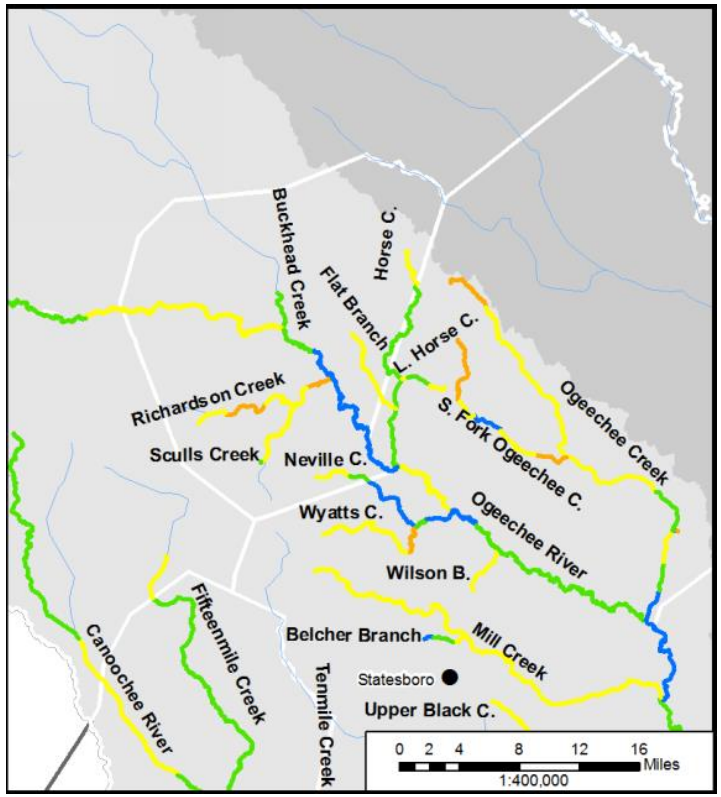
Optional Slides

Surface Water Quality/Assimilative Capacity Gaps

- Ogeechee Basin GA DOSAG Model Results



Round 1



Update

Legend

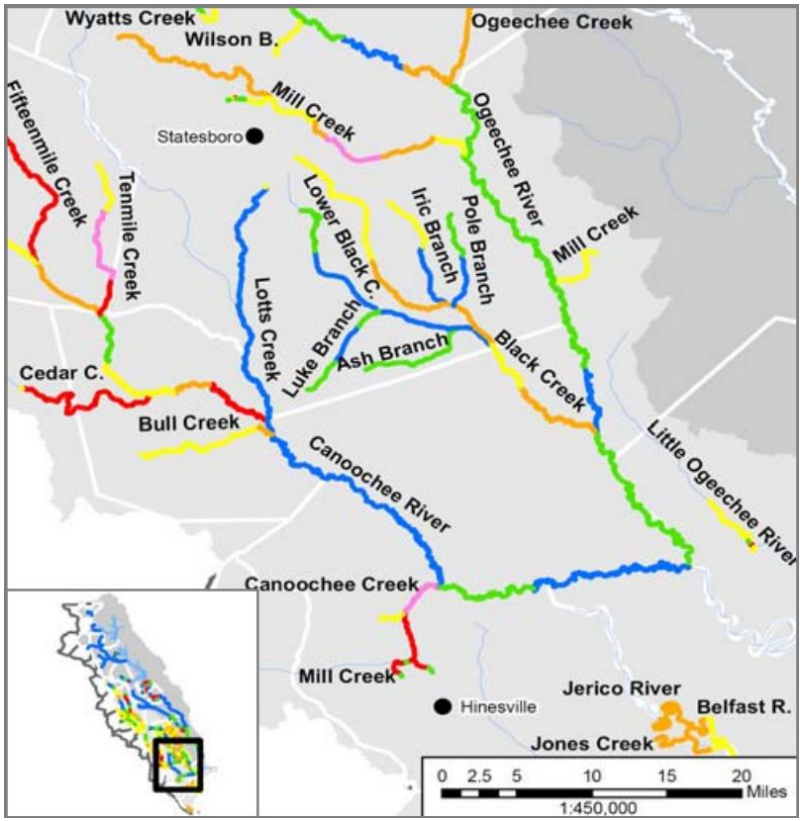
Avalable Assimilative Capacity

- Very Good ≥ 1 mg/L DO available
- Good 0.5 mg/L to < 1 mg/L DO available
- Moderate 0.2 mg/L to < 0.5 mg/L DO available
- Limited >0 mg/L to <0.2 mg/L DO available
- At Assimilative Capacity 0 mg/L DO available
- None or Exceeded < 0.0 mg/L DO available
- Unmodeled Lakes and Streams

Georgia

Surface Water Quality/Assimilative Capacity Gaps

- Ogeechee Basin GA DOSAG Model Results



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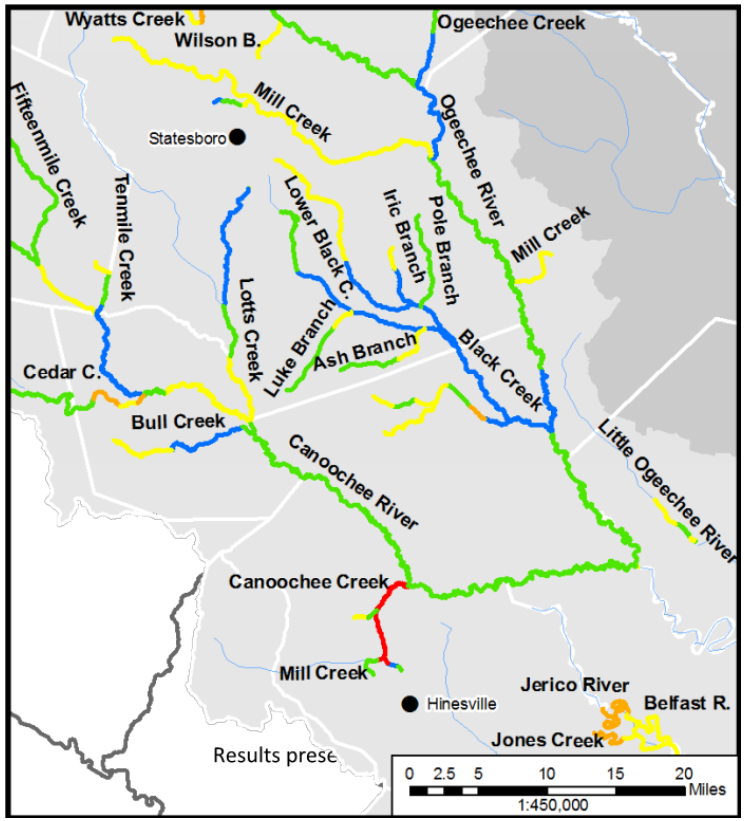

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Georgia

Surface Water Quality/Assimilative Capacity Gaps

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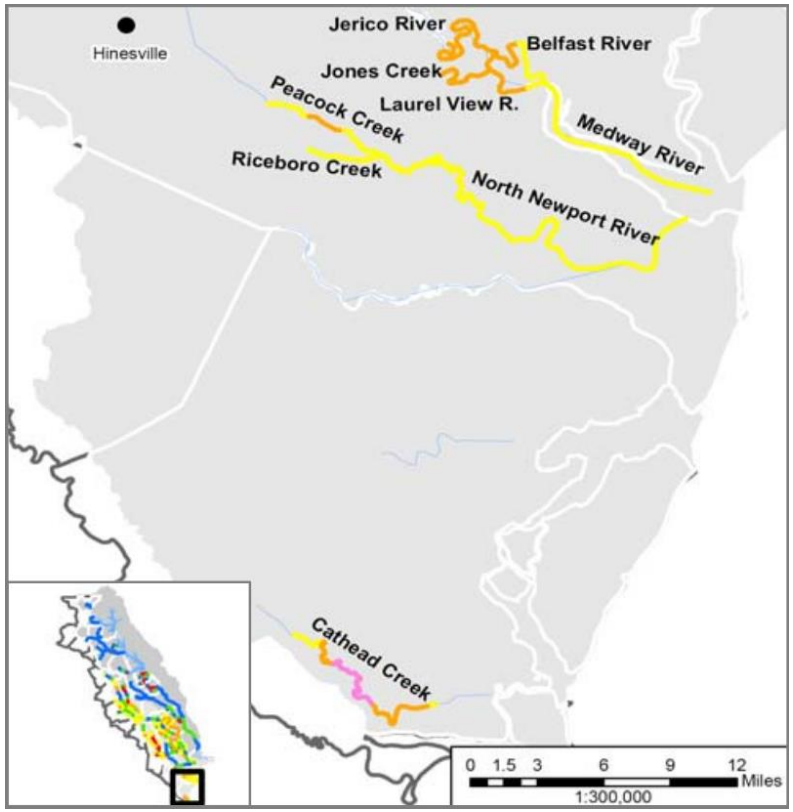

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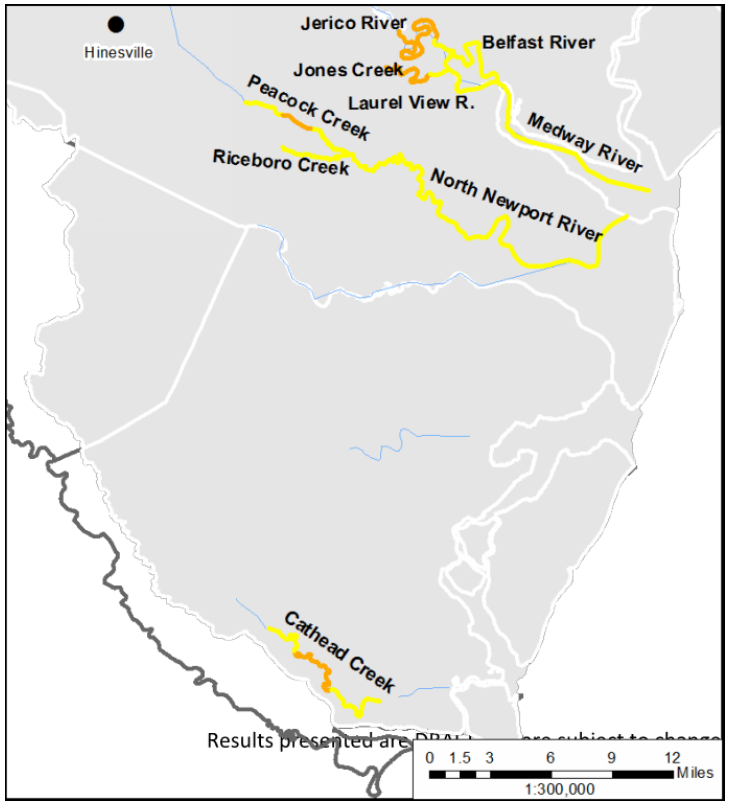

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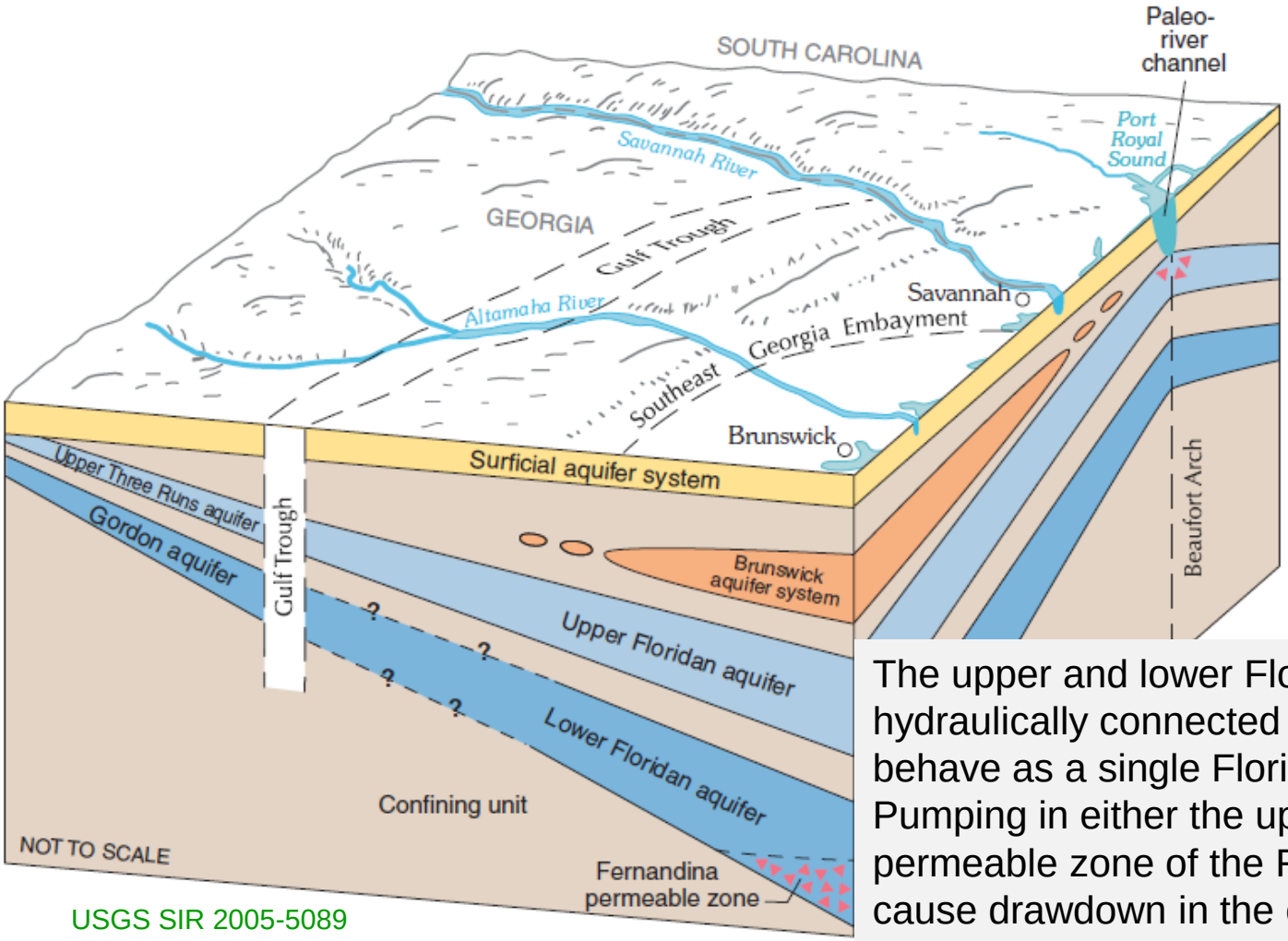
Georgia

Aquifers in Coastal Georgia



USGS SIR 2005-5089

The upper and lower Floridan Aquifers are hydraulically connected so the two aquifers behave as a single Floridan Aquifer system. Pumping in either the upper or lower permeable zone of the Floridan Aquifer will cause drawdown in the other zone

Georgia

Floridan Groundwater User

- Red Zone Quick Statistics
  - The 2 largest permit holders represent 64% of the Red Zone total permit limits
  - The 10 largest permit holders represent 83% of the Red Zone total permit limits
  - The 2 largest permit holders represent 44% of the Total Red and Yellow Zone permit limits
- Yellow Zone Quick Statistics
  - The 2 largest permit holders represent 58% of the Yellow Zone total permit limits
  - The 6 largest permit holders represent 89% of the Yellow Zone total permit limits

Recommendations Subcommittee Members

- Met on November 17th
- There was consensus that an approximately 16% pro rata reduction should be taken by everyone to achieve the 2020 reduction target (Red Zone)
- There was general agreement that if permits are not reissued then that permit limit value should be used to reduce each entities pro rata share ("taken off the top")
- There was general agreement that the recommendations to EPD include a request to not allow net increases in Floridan Aquifer withdrawals

Georgia

Recommendations Subcommittee Members (Cont.)

- There was general agreement to recommend that existing public water systems should be required to obtain groundwater permits by 2020 in the subject 4 county area
- There was general agreement to recommend that it be illegal to drill a ground water well in the four county area if property line is within 1000 feet of public water system
- There was general agreement to recommend that EPD require individual permittees to do their due diligence on feasibility to connect to surface water plants

Recommendations Subcommittee Members (Cont.)

- There was discussion about "special cases" but consensus was not reached
- There was discussion regarding creating a Trust or other funding mechanism to implement joint projects/activities but consensus was not reached
- There was discussion regarding the timing, rationale, quantity of requested reductions, and priority of use

Mathematical Formula Subcommittee - Report

- Met on October 29th
- Reviewed and discussed potential use of a sliding scale to determine reduction value(s) utilizing several approaches
  - A focus on location of cone of depression
  - A focus on groundwater use versus permit limit
  - A focus on past permit reductions
- Pros and cons
  - Would involve some entity(s) taking larger permit reduction in order for others to take smaller permit reductions
- Some entities may not have the ability to obtain surface water
- Some entities may exceed the reduced permit limits based on 2013 use

Mathematical Formula Subcommittee – Report (Cont.)

- Entity should be responsible for their pro rata reduction
- All permit holders should take a pro rata reduction
- All permit holders would be required to take:
  - **16.45** % reduction to achieve the 2020 Red Zone reduction target of 10MGD
  - **24.67** % reduction to achieve the 2025 Red Zone reduction target of 15 MGD
  - **3.60** % reduction to achieve the 2025 Yellow Zone reduction target of 1 MGD
- Some Subcommittee members wanted to see more work completed regarding:
  - The specifics of the various wholesale water agreements
  - A sliding scale approach with regards to credits for previous cuts, efforts and other achievements such as conservation and/or the use of other alternatives

Georgia

Additional Use of Surface Water Using Existing Infrastructure Subcommittee – Report

- Savannah I&D water is provided to customers in two ways
  - Wholesale customers ($1.95/1000gallons)
  - Contract Customers ($.70-$.80/1000 gallons cost based on monthly actual production/deliveries)
- Typical groundwater production costs are $.45-$.50/1000 gallons an approximate cost differential of $.35-$1.45/1000 gallons

Photo from HGDB Website