Results of Surface Water Conservation Strategies

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Agenda Item 8

Review of Surface Water Scenarios

Base Scenarios

- Current Surface Water Use Scenario
  - *Uses most recent 10-yr average withdrawals (as reported by month)*
- Permitted and Registered (P&R) Surface Water Use Scenario
  - *Uses current fully-permitted and registered amounts*
- **Moderate Water Demand Projection Scenario to year 2070**
  - *Future water demand projection based on moderate growth and normal climate*
- **High Water Demand Projection Scenario to year 2070**
  - *Future water demand projection based on high growth and hot/dry climate*

Additional Scenarios

- Unimpaired Flow (UIF) Scenario
  - *Naturalized conditions (no surface water withdrawals, discharges, or reservoirs)*

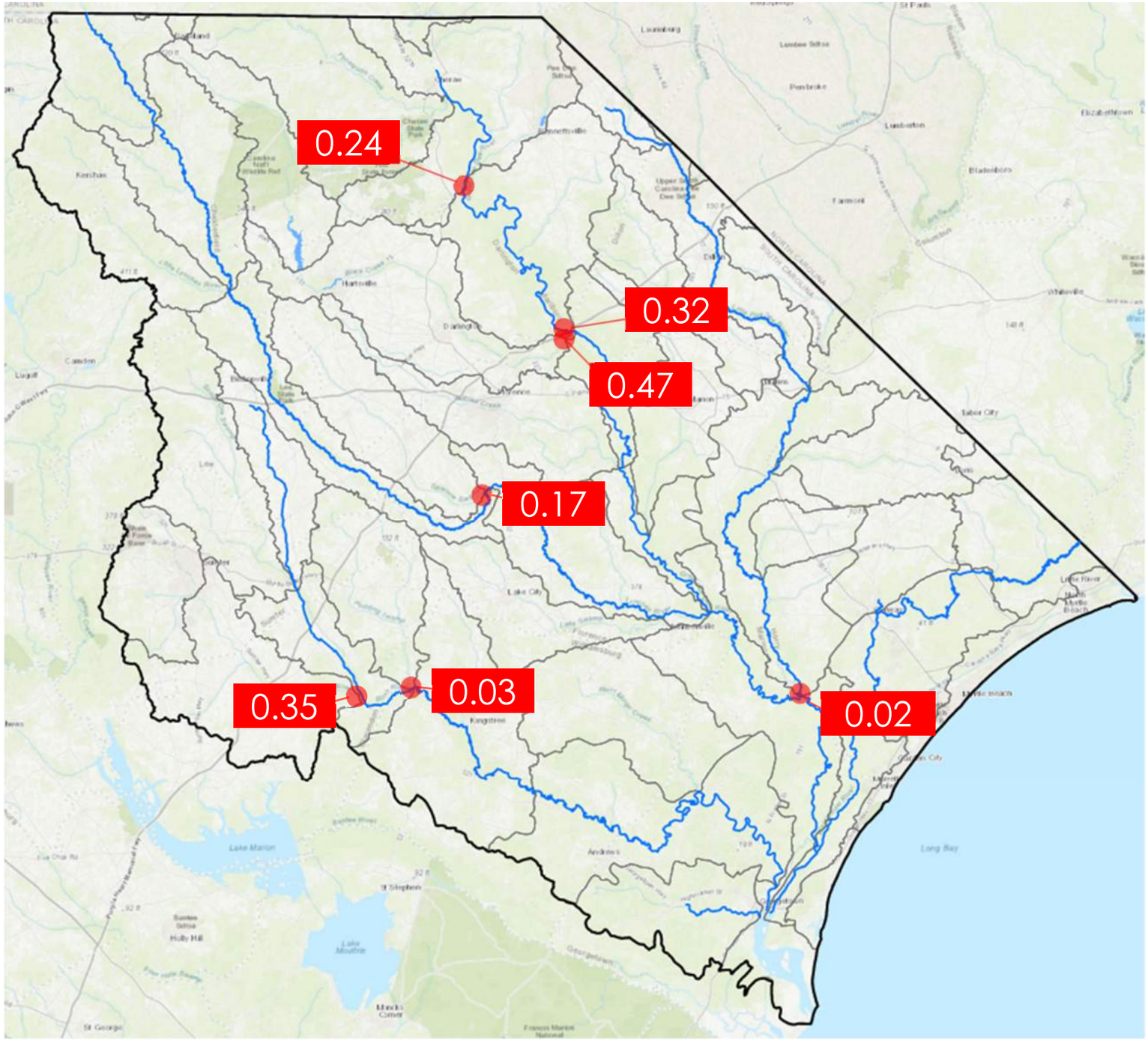
Projected, NEW Agricultural Demands

2070 High Demand Scenario

Scenario	Added Agriculture Demand (mgd)
High Demand	0.35

HUC 10 Outlet

HUC 10s without values are assumed to have no additional Ag demand

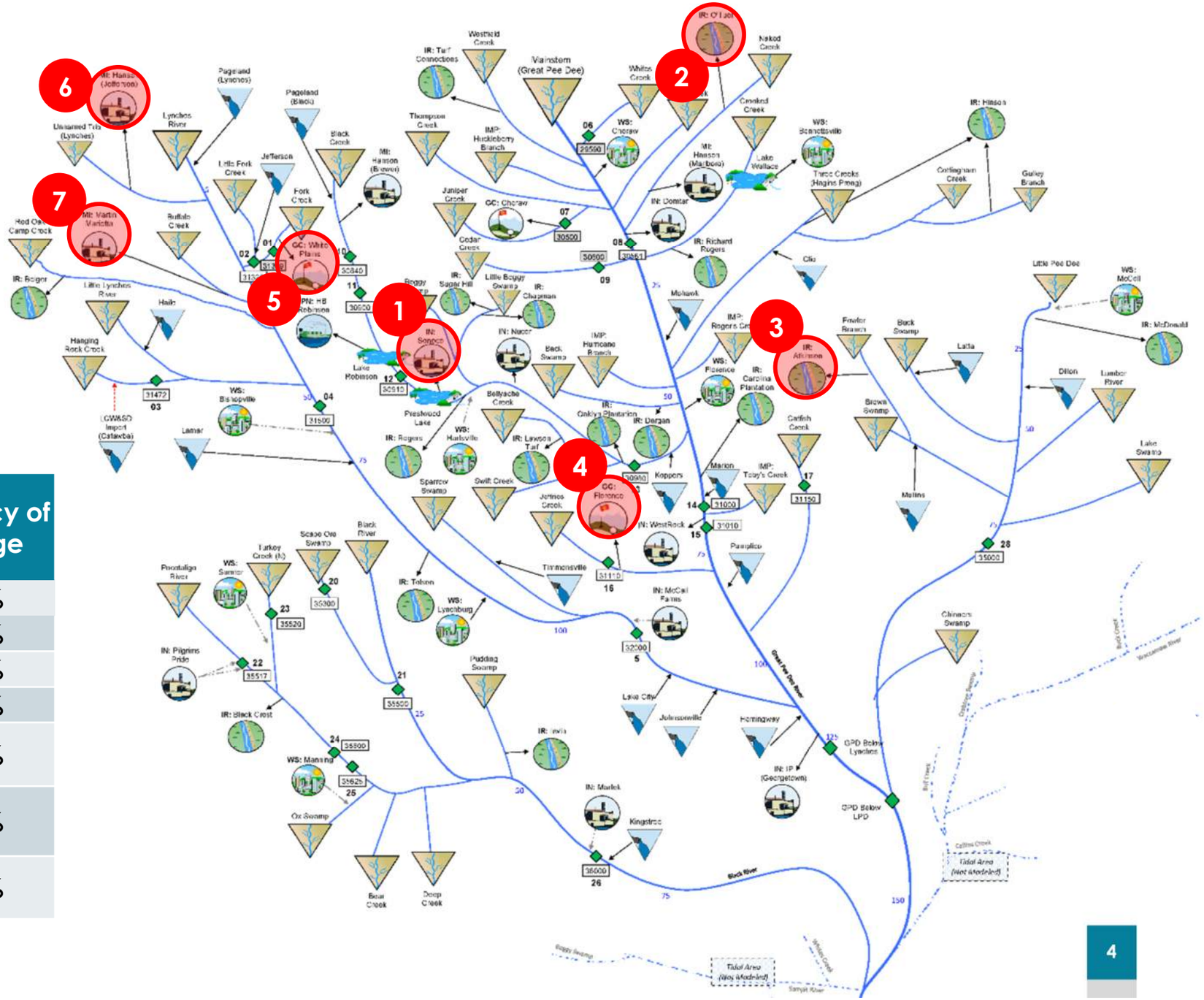


2070 High Demand Scenario

1 Physical Shortage

Surface Water Shortage Table

Map ID	Water User	Max Shortage (MGD)	Frequency of Shortage
1	IN: Sonoco	21.0	1.3%
2	IR: O'Tuel	0.3	0.4%
3	IR: Atkinson	0.05	1.2%
4	GC: Florence	0.1	0.3%
5	GC: White Plains	0.1	8.2%
6	MI: Hanson (Jefferson)	0.1	7.1%
7	MI: Martin Marrietta	1.1	1.3%



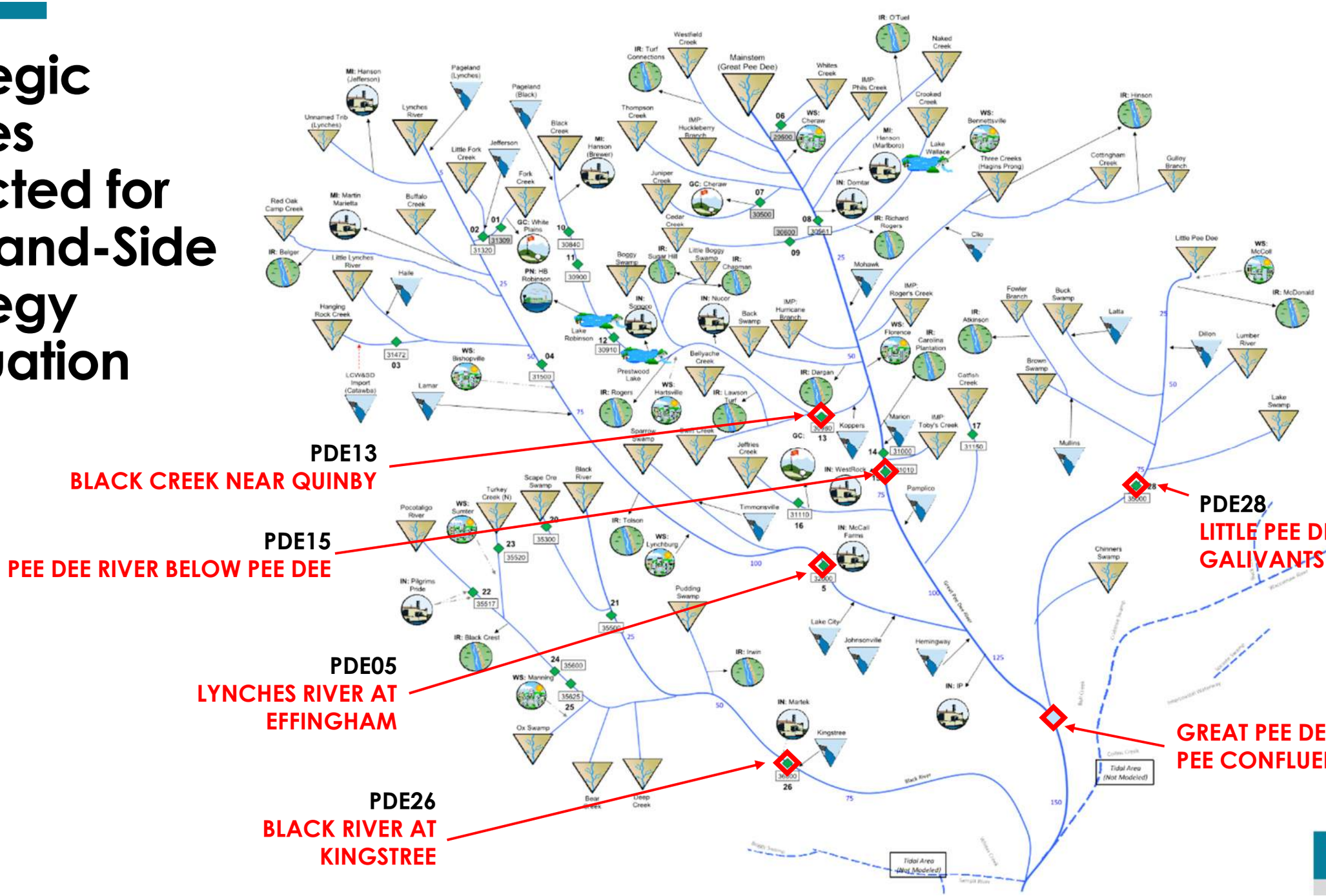
Approach to Evaluate Conservation (Demand-Side) Strategies

1. Make reasonable assumptions about potential percent reductions in surface water demand, by sector
2. Apply those assumptions to the **High Demand 2070 Scenario**, and evaluate the changes in streamflow at select, Strategic Nodes

Conservation Scenarios

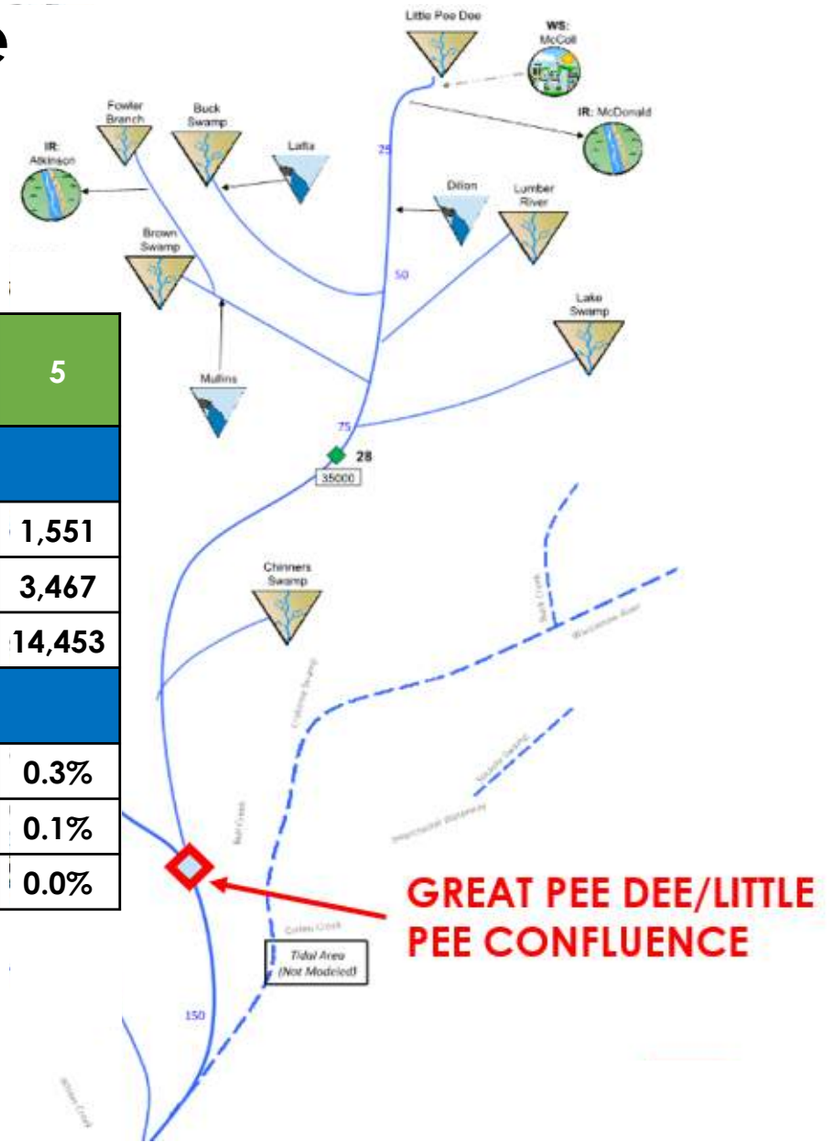
1. **Agricultural** demand reduction (10%)
2. **Municipal** demand reductions for surface water users only
    a. 10% reduction
    b. 15% reduction
    c. 20% reduction
3. **Municipal** demand reductions for *both* surface water and groundwater users
    a. 10% reduction
    b. 15% reduction
    c. 20% reduction
4. **Industrial** demand reduction (5%) for surface and groundwater users (not mining)
5. **Agricultural**, **municipal**, and **industrial** demand reductions combined (Scenarios 1, 3a, and 4).

Strategic Nodes Selected for Demand-Side Strategy Evaluation



Demand-Side Scenario Simulated Flows at the Great Pee Dee/Little Pee Dee Confluence

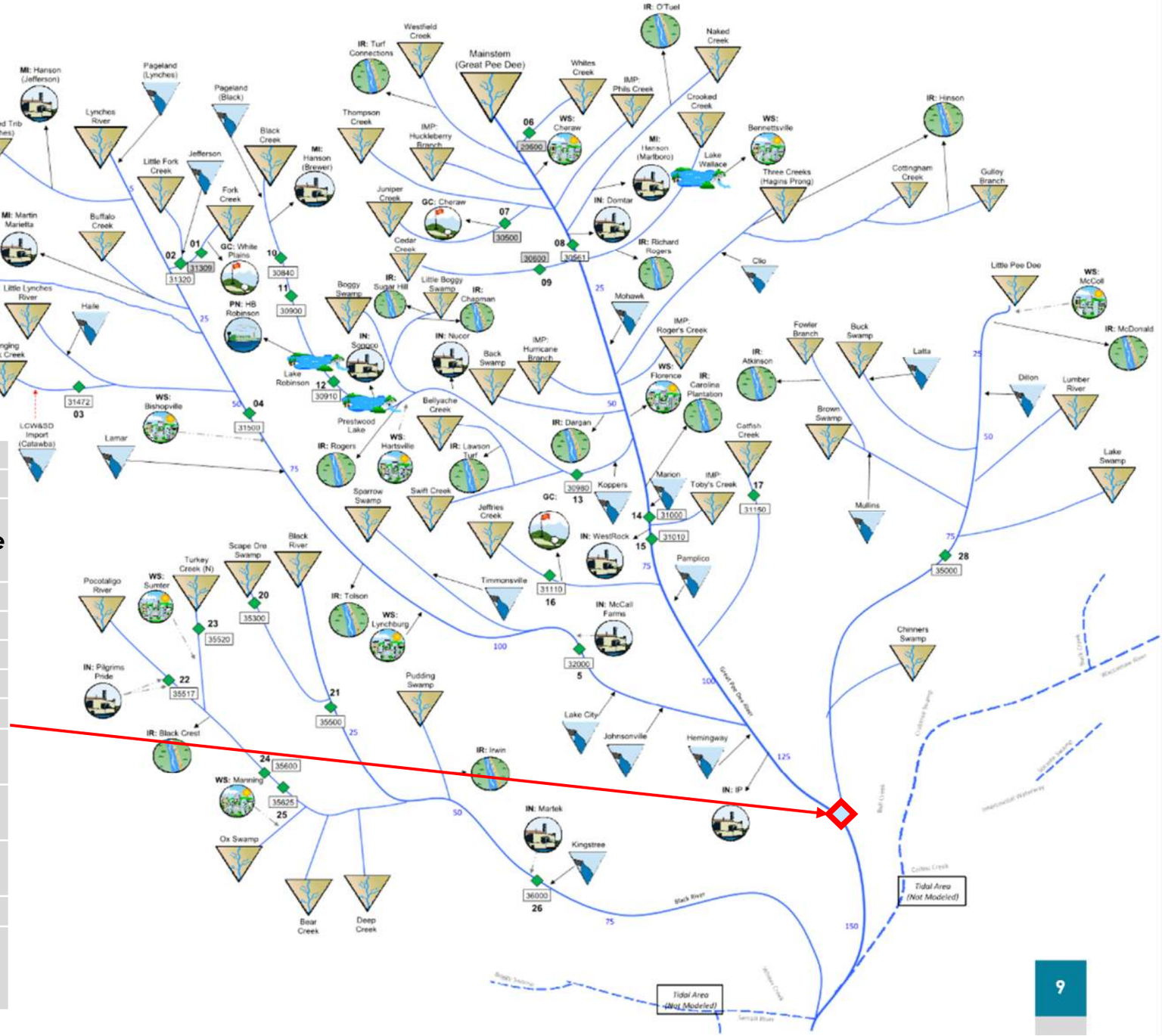
Performance Measures	2070 High Demand Scenario	1	2a	2b	2c	3a	3b	3c	4	5
	Great Pee Dee River below Little Pee Dee Confluence (flow in cfs)									
Minimum Flow	1,547	1,548	1,548	1,549	1,550	1,546	1,546	1,546	1,550	1,551
5th Percentile Flow	3,464	3,464	3,465	3,466	3,466	3,463	3,462	3,462	3,467	3,467
Mean flow	14,450	14,451	14,451	14,452	14,452	14,449	14,449	14,448	14,454	14,453
Performance Measures	Great Pee Dee River below Little Pee Dee Confluence (% change from 2070 High Demand Scenario)									
Minimum Flow	--	0.1%	0.1%	0.2%	0.2%	0.0%	0.0%	0.0%	0.2%	0.3%
5th Percentile Flow	--	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.1%
Mean flow	--	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%



Demand-Side Scenario Minimum Flows

The table shows the minimum flow and percent change from **2070 HD Scenario** minimum flows for each demand-side scenario

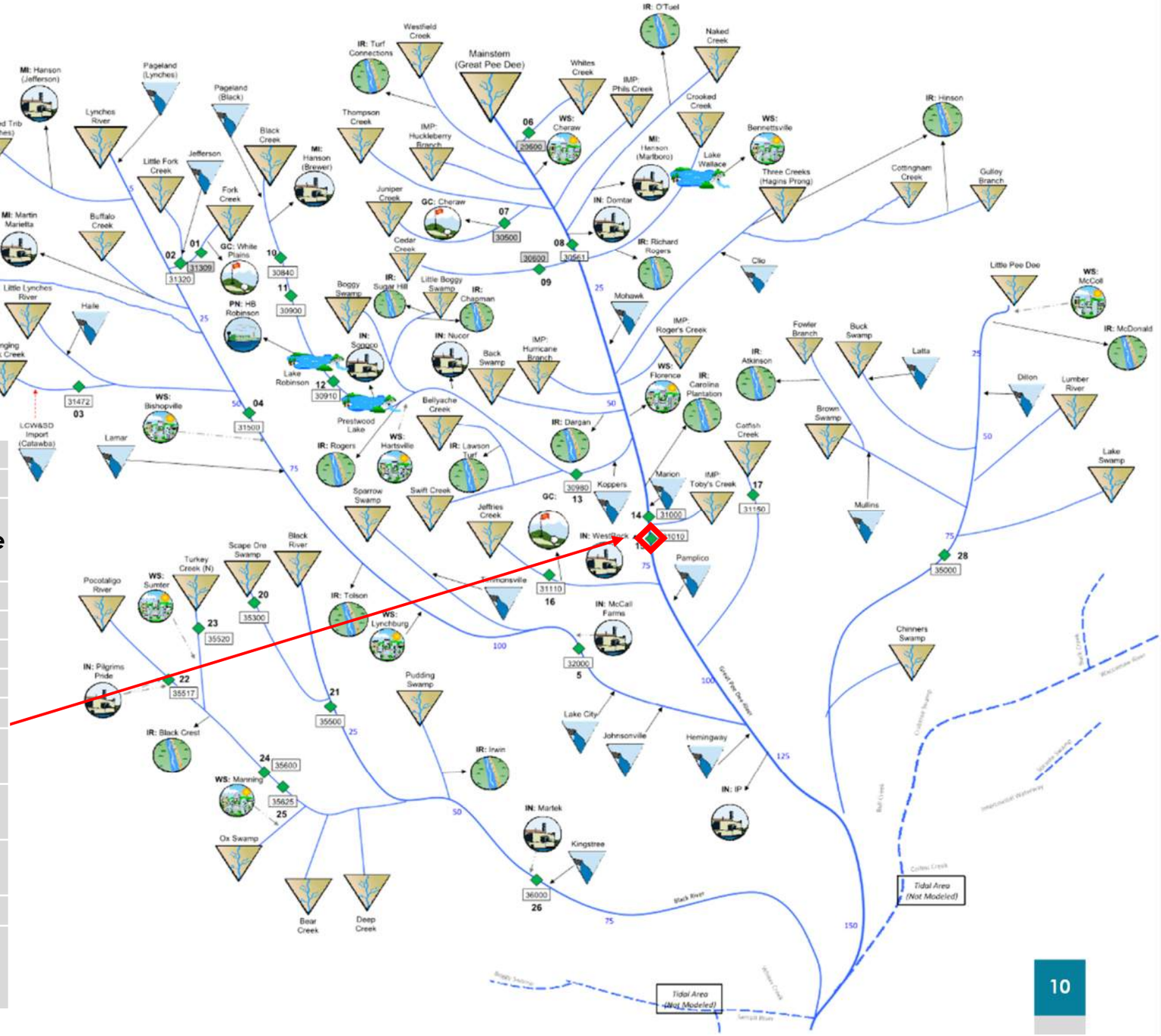
GREAT PEE DEE/LITTLE PEE DEE CONFLUENCE		
	Minimum Flow (cfs)	**% Change**
2070 High Demand	1,547	--
Scenario 1 (Ag Red. 10%)	1,548	0.1%
Scenario 2a (Municipal SW Red. 10%)	1,548	0.1%
Scenario 2b (Municipal SW Red. 15%)	1,549	0.2%
Scenario 2c (Municipal SW Red. 20%)	1,550	0.2%
Scenario 3a (Municipal SW and GW Red. 10%)	1,546	0.0%
Scenario 3b (Municipal SW and GW Red. 15%)	1,546	0.0%
Scenario 3c (Municipal SW and GW Red. 20%)	1,546	0.0%
Scenario 4 (Industrial Red. 5%)	1,550	0.2%
Scenario 5 (Ag Red. 10%, Municipal SW and GW Red. 10%, and Industrial Red. 5%)	1,551	0.3%



Demand-Side Scenario Minimum Flows

The table shows the minimum flow and percent change from **2070 HD Scenario** minimum flows for each demand-side scenario

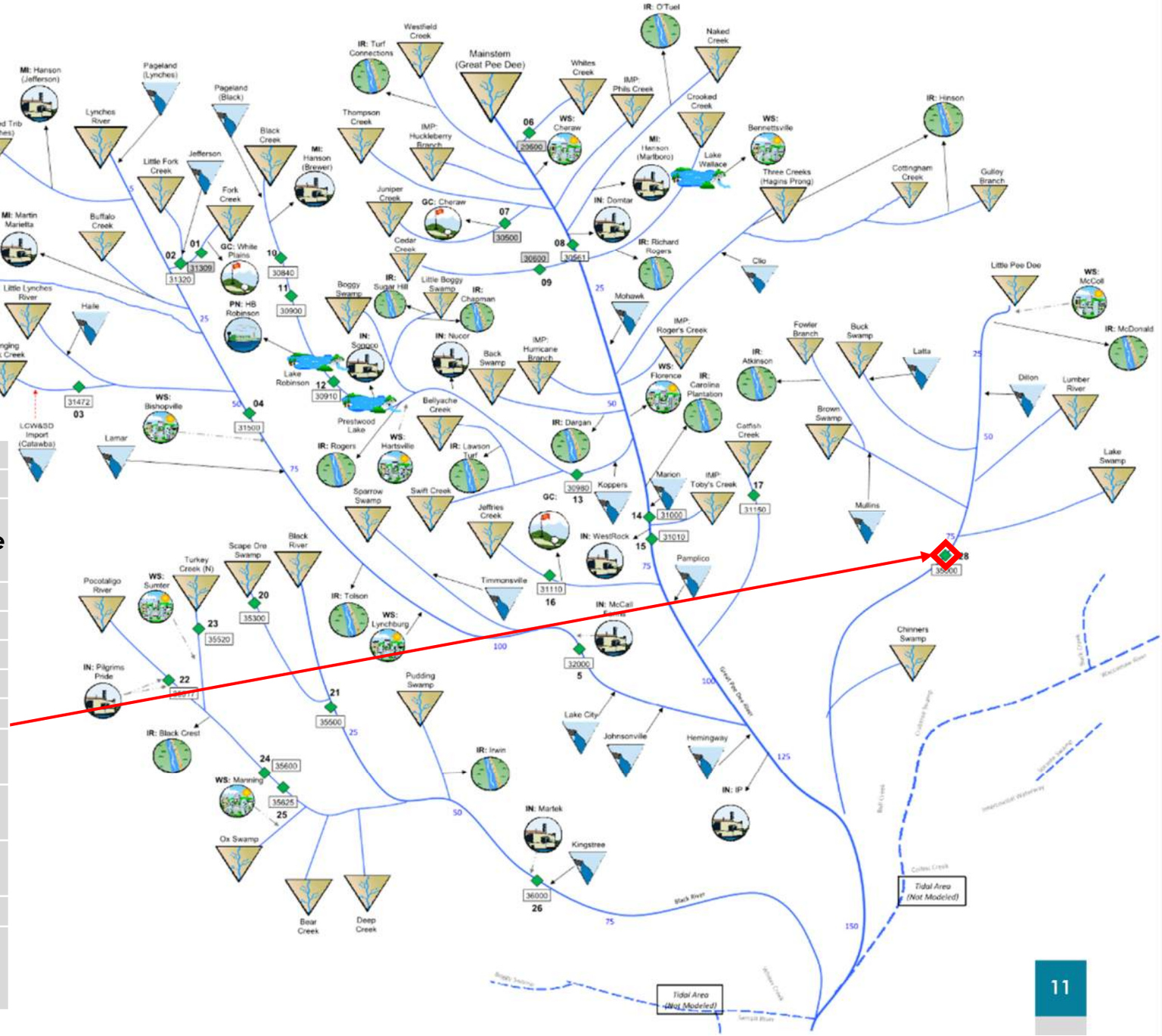
PEE DEE RIVER BELOW PEE DEE		
PDE15		
	Minimum Flow (cfs)	**% Change**
2070 High Demand	**928**	--
Scenario 1 (Ag Red. 10%)	929	0.1%
Scenario 2a (Municipal SW Red. 10%)	932	0.4%
Scenario 2b (Municipal SW Red. 15%)	934	0.7%
Scenario 2c (Municipal SW Red. 20%)	936	0.9%
Scenario 3a (Municipal SW and GW Red. 10%)	931	0.4%
Scenario 3b (Municipal SW and GW Red. 15%)	933	0.6%
Scenario 3c (Municipal SW and GW Red. 20%)	935	0.8%
Scenario 4 (Industrial Red. 5%)	939	1.3%
Scenario 5 (Ag Red. 10%, Municipal SW and GW Red. 10%, and Industrial Red. 5%)	944	1.8%



Demand-Side Scenario Minimum Flows

The table shows the minimum flow and percent change from **2070 HD Scenario** minimum flows for each demand-side scenario

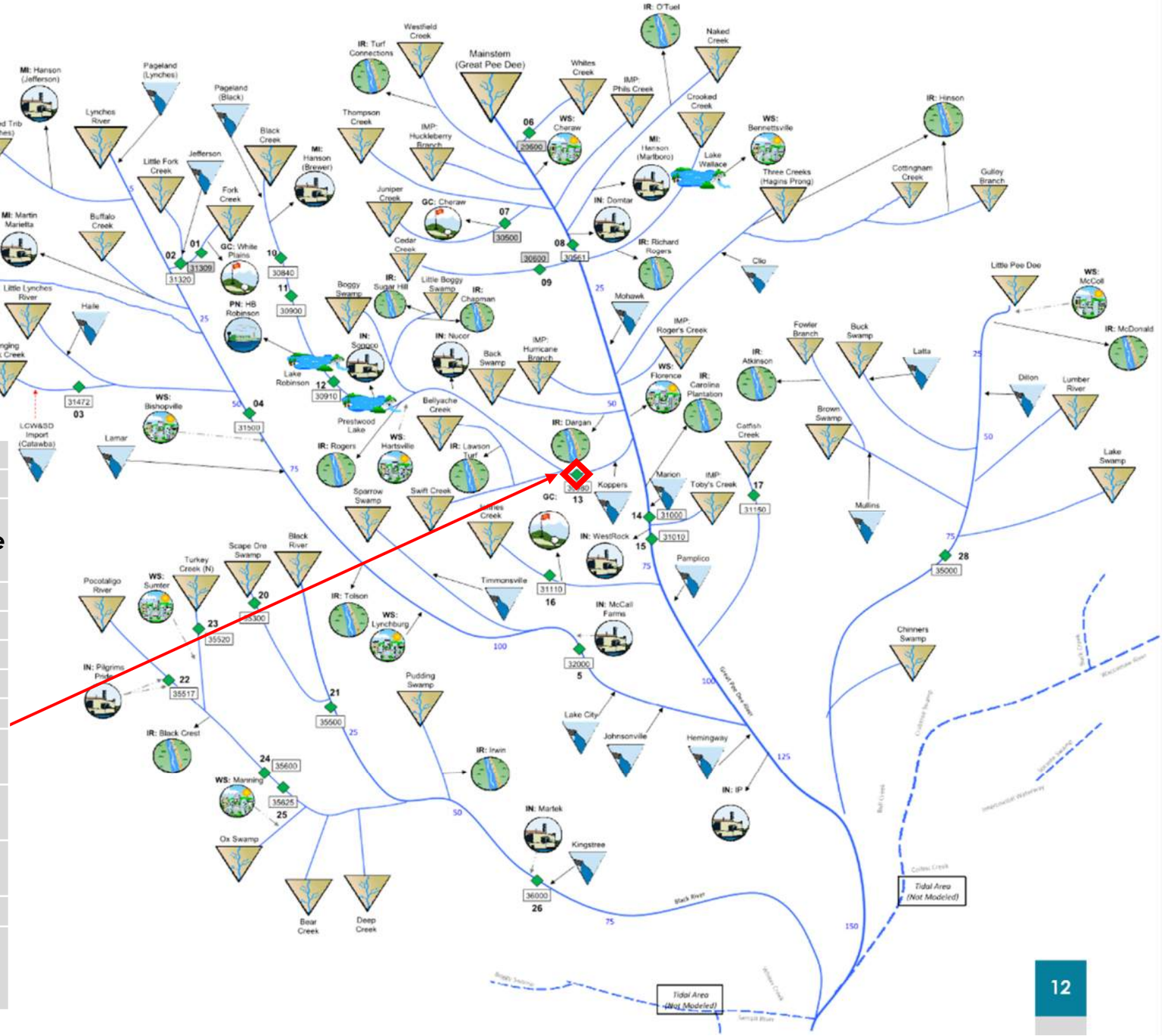
LITTLE PEE DEE RIVER AT GALIVANTS FERRY PDE28		
	Minimum Flow (cfs)	**% Change**
2070 High Demand	198	--
Scenario 1 (Ag Red. 10%)	198	0.0%
Scenario 2a (Municipal SW Red. 10%)	198	0.0%
Scenario 2b (Municipal SW Red. 15%)	198	0.0%
Scenario 2c (Municipal SW Red. 20%)	198	0.0%
Scenario 3a (Municipal SW and GW Red. 10%)	197	-0.3%
Scenario 3b (Municipal SW and GW Red. 15%)	197	-0.4%
Scenario 3c (Municipal SW and GW Red. 20%)	197	-0.5%
Scenario 4 (Industrial Red. 5%)	198	0.0%
Scenario 5 (Ag Red. 10%, Municipal SW and GW Red. 10%, and Industrial Red. 5%)	197	-0.3%



Demand-Side Scenario Minimum Flows

The table shows the minimum flow and percent change from **2070 HD Scenario** minimum flows for each demand-side scenario

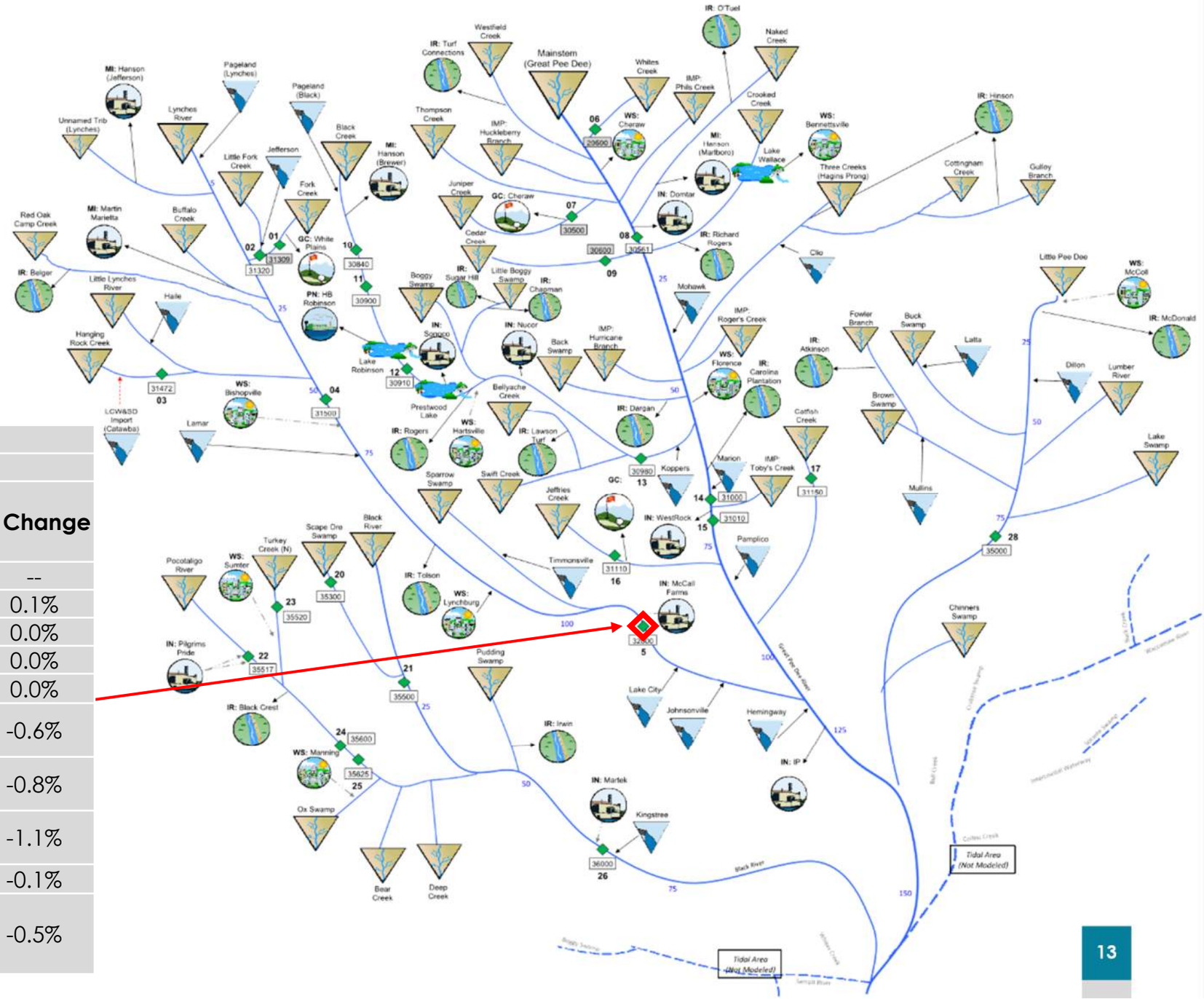
BLACK CREEK NEAR QUINBY PDE13		
	Minimum Flow (cfs)	**% Change**
2070 High Demand	53	--
Scenario 1 (Ag Red. 10%)	54	0.5%
Scenario 2a (Municipal SW Red. 10%)	53	-0.5%
Scenario 2b (Municipal SW Red. 15%)	53	-0.7%
Scenario 2c (Municipal SW Red. 20%)	53	-0.9%
Scenario 3a (Municipal SW and GW Red. 10%)	53	-1.1%
Scenario 3b (Municipal SW and GW Red. 15%)	52	-1.7%
Scenario 3c (Municipal SW and GW Red. 20%)	52	-2.2%
Scenario 4 (Industrial Red. 5%)	53	0.0%
Scenario 5 (Ag Red. 10%, Municipal SW and GW Red. 10%, and Industrial Red. 5%)	53	-0.6%



Demand-Side Scenario Minimum Flows

The table shows the minimum flow and percent change from **2070 HD Scenario** minimum flows for each demand-side scenario

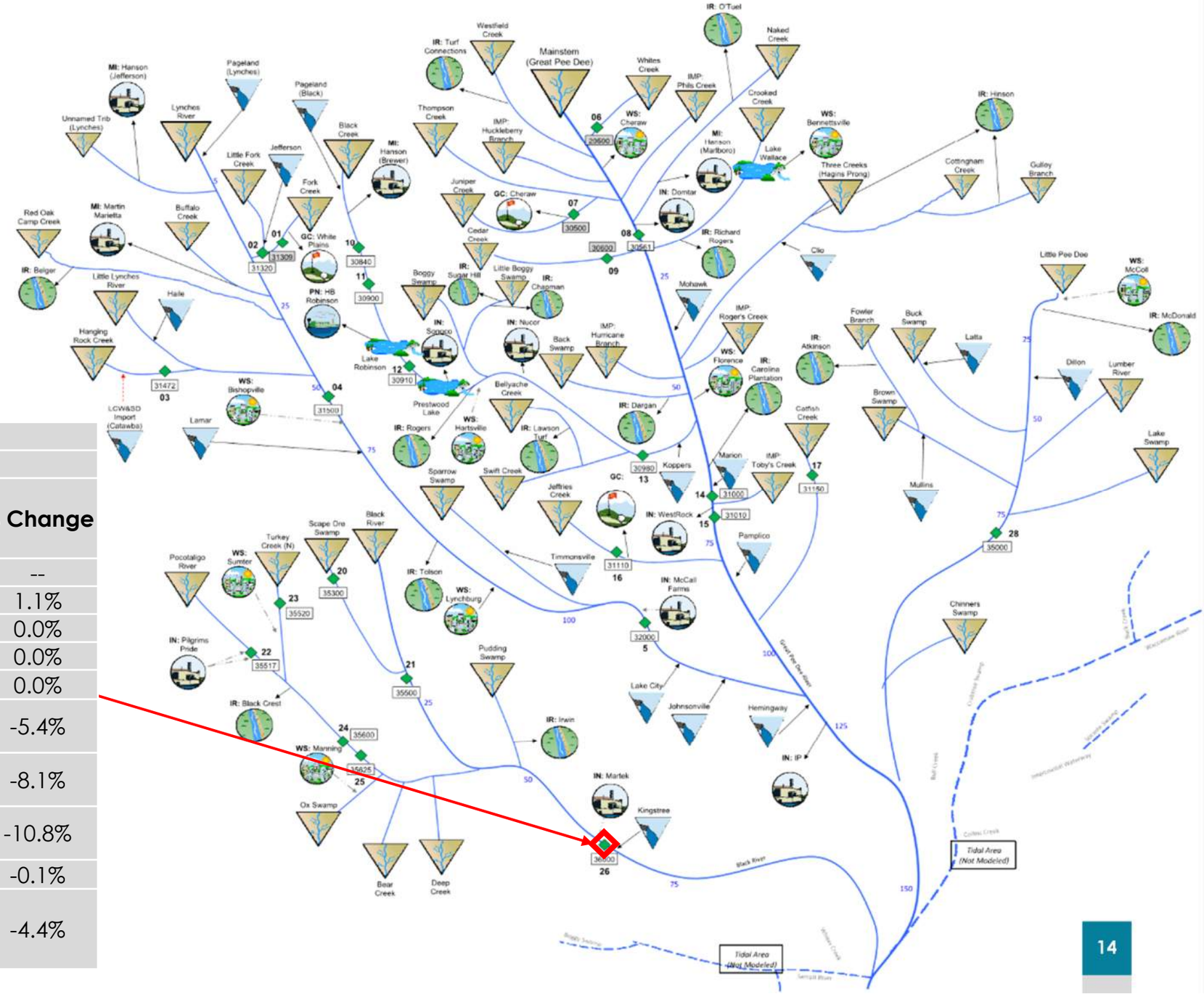
LYNCHES RIVER AT EFFINGHAM PDE05		
	Minimum Flow (cfs)	**% Change**
2070 High Demand	71	--
Scenario 1 (Ag Red. 10%)	71	0.1%
Scenario 2a (Municipal SW Red. 10%)	71	0.0%
Scenario 2b (Municipal SW Red. 15%)	71	0.0%
Scenario 2c (Municipal SW Red. 20%)	71	0.0%
Scenario 3a (Municipal SW and GW Red. 10%)	70	-0.6%
Scenario 3b (Municipal SW and GW Red. 15%)	70	-0.8%
Scenario 3c (Municipal SW and GW Red. 20%)	70	-1.1%
Scenario 4 (Industrial Red. 5%)	71	-0.1%
Scenario 5 (Ag Red. 10%, Municipal SW and GW Red. 10%, and Industrial Red. 5%)	71	-0.5%



Demand-Side Scenario Minimum Flows

The table shows the minimum flow and percent change from **2070 HD Scenario** minimum flows for each demand-side scenario

BLACK RIVER AT KINGSTREE PDE26		
	Minimum Flow (cfs)	**% Change**
2070 High Demand	47	--
Scenario 1 (Ag Red. 10%)	48	1.1%
Scenario 2a (Municipal SW Red. 10%)	47	0.0%
Scenario 2b (Municipal SW Red. 15%)	47	0.0%
Scenario 2c (Municipal SW Red. 20%)	47	0.0%
Scenario 3a (Municipal SW and GW Red. 10%)	45	-5.4%
Scenario 3b (Municipal SW and GW Red. 15%)	43	-8.1%
Scenario 3c (Municipal SW and GW Red. 20%)	42	-10.8%
Scenario 4 (Industrial Red. 5%)	47	-0.1%
Scenario 5 (Ag Red. 10%, Municipal SW and GW Red. 10%, and Industrial Red. 5%)	45	-4.4%



Summary

- The demand-side conservation strategies result in minimal impact to low flows conditions when compared to the 2070 High Demand scenario.
- Impacts to flows were generally the largest under **Scenario 5** (conservation for agricultural, municipal, and industrial water users).
- At several locations, minimum flows decrease due to a reduction in groundwater withdrawals, and the associated decrease in treated wastewater being returned to surface water upstream.

Benefits of Water Conservation and Efficiency

- Reduce costs of water for irrigation and possibly improve crop yields
- Lower costs of water for homeowners and reduce or delay a municipality's need to develop more water supplies
- Conservation in groundwater dependent communities may be important for sustaining groundwater supplies
- Can help extend supplies for users on small/headwater tributaries and mitigate impact of drought

Chapter 5 (Surface Water Only)

Agenda Item 9

Chapter 5 Outline *(surface water portion only)*

- **5.1 Methodology**
  - 5.1.1 Surface Water
- **5.2 Performance Measures**
  - 5.2.1 Surface Water Performance Measures
- **5.3 Scenario Descriptions and Surface Water Simulation Result**
  - 5.3.1 – 5.3.5 Current Use, P&R, Moderate Demand, High Demand, UIF
  - 5.3.6 Comparison of Low Flows
  - 5.3.7 Application of Biological Response Metrics
- **5.5 Summary**