

# Review and Update of Surface Water Availability Modeling

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# Surface Water Scenarios

## Base Scenarios

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

# Summary of Average Annual Surface Water Demands by Scenario (in MGD)

Surface Water Use Sector	Current Use	Permitted and Registered (P&R)	Current Use as a Percent of P&R
Mining	0.1	0.5	14%
Agriculture	2.7	15.2	18%
Golf Courses	0.6	10.1	6%
Industrial/Manufacturing	24.9	44.9	55%
Public Water Supply	142.6	525.1	27%
Thermoelectric <sup>1</sup>	171.2	502.0	34%
<b>Total all Sectors*</b>	<b>342</b>	<b>1,098</b>	<b>31%</b>
<b>Total without Thermoelectric*</b>	<b>171</b>	<b>596</b>	<b>29%</b>

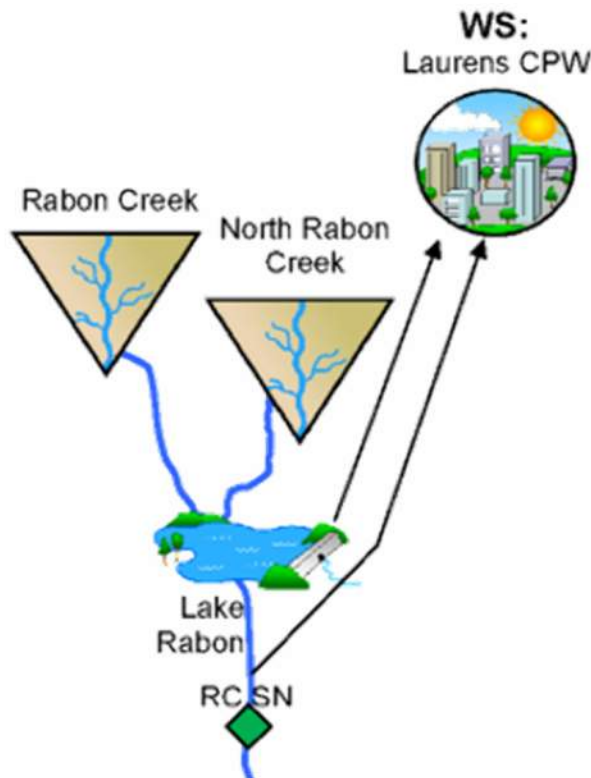
\* Rounded to nearest MGD

<sup>1</sup> Approximately 76% of the thermoelectric withdrawals are returned

# Updates to Current Use and P&R Scenarios

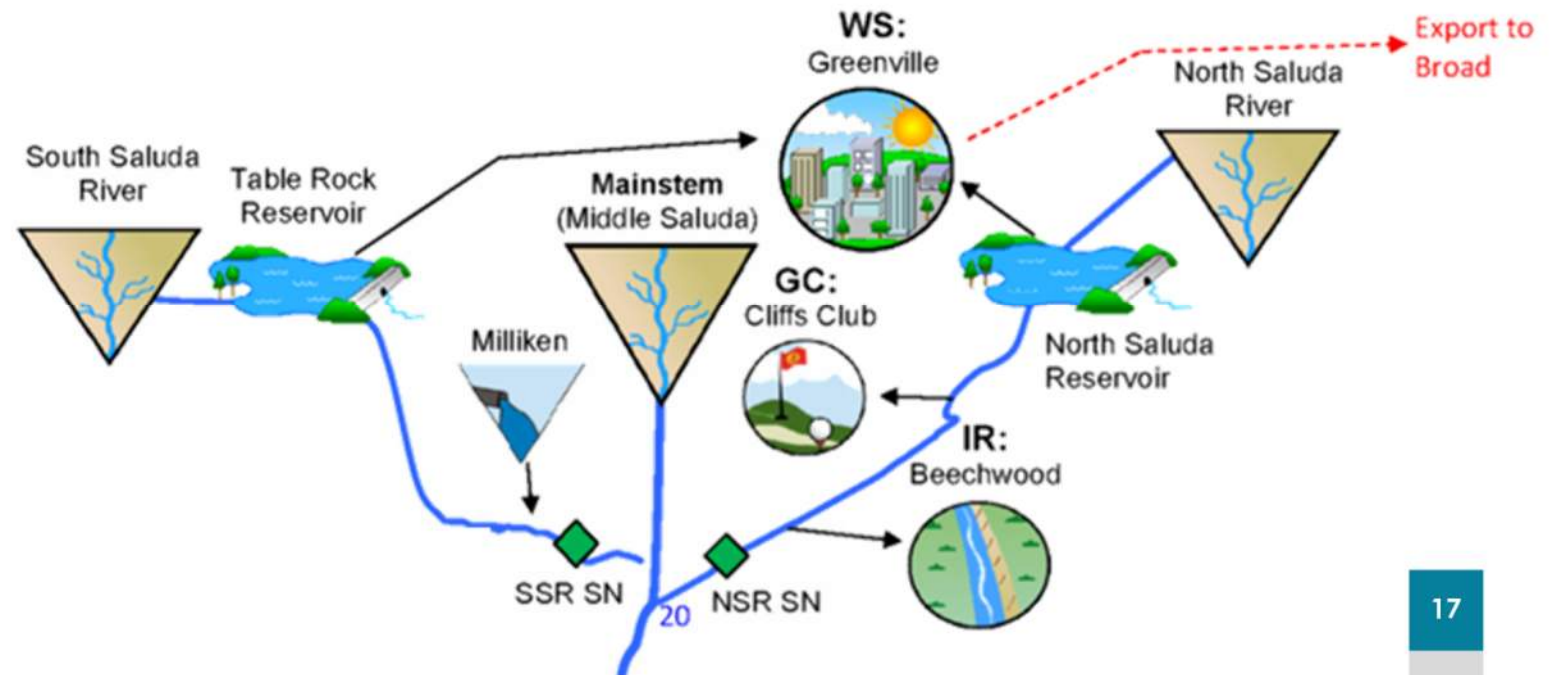
- Lake Rabon

- Added dead pool storage
- Add minimum release of **9 cfs**



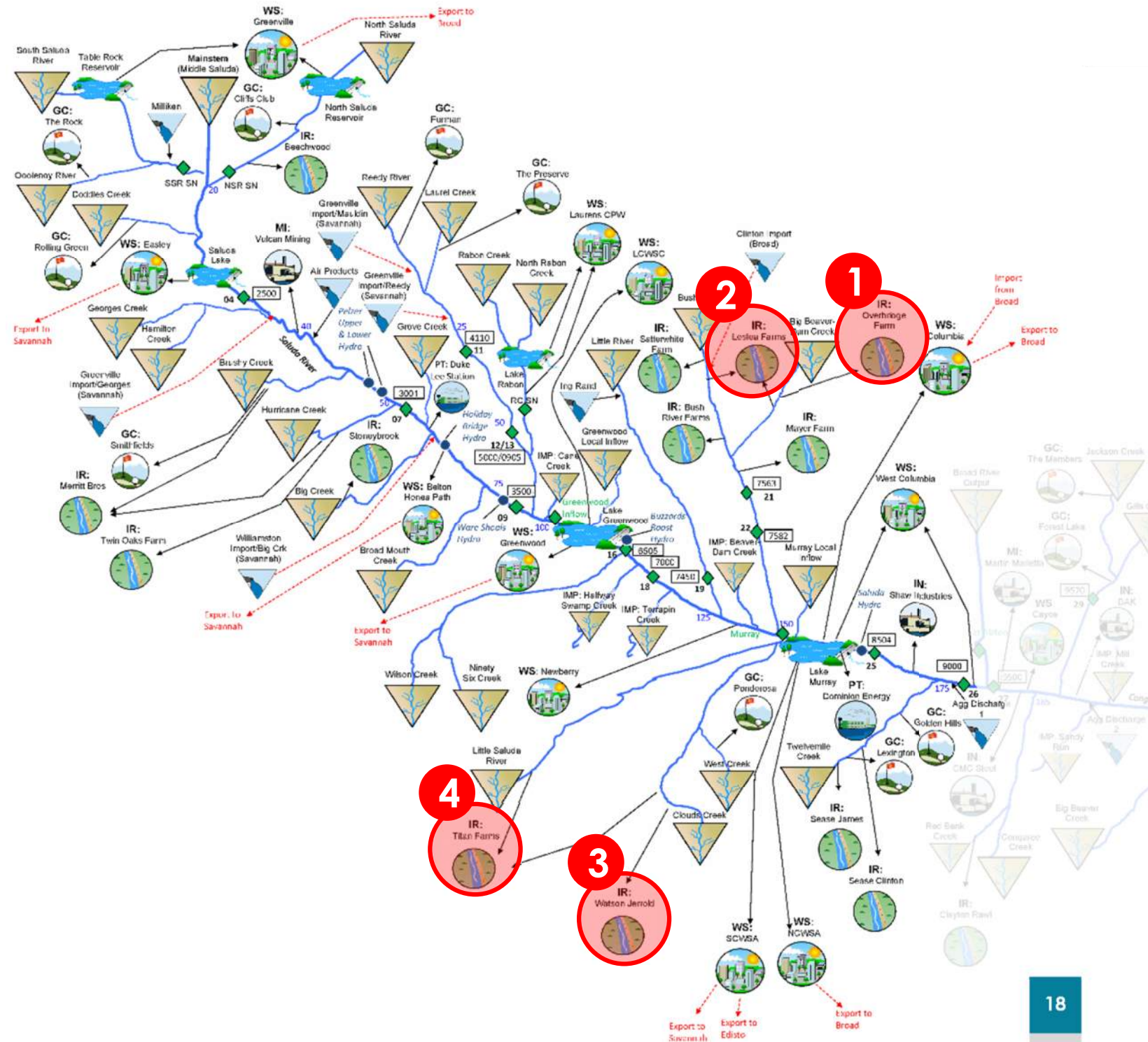
- Table Rock and North Saluda Reservoirs

- Add minimum release of **3 MGD (4.65 cfs)** to both reservoirs
- Adjusted operating rules to better balance the withdrawals



# Current Use Scenario

## 1 Physical Shortage



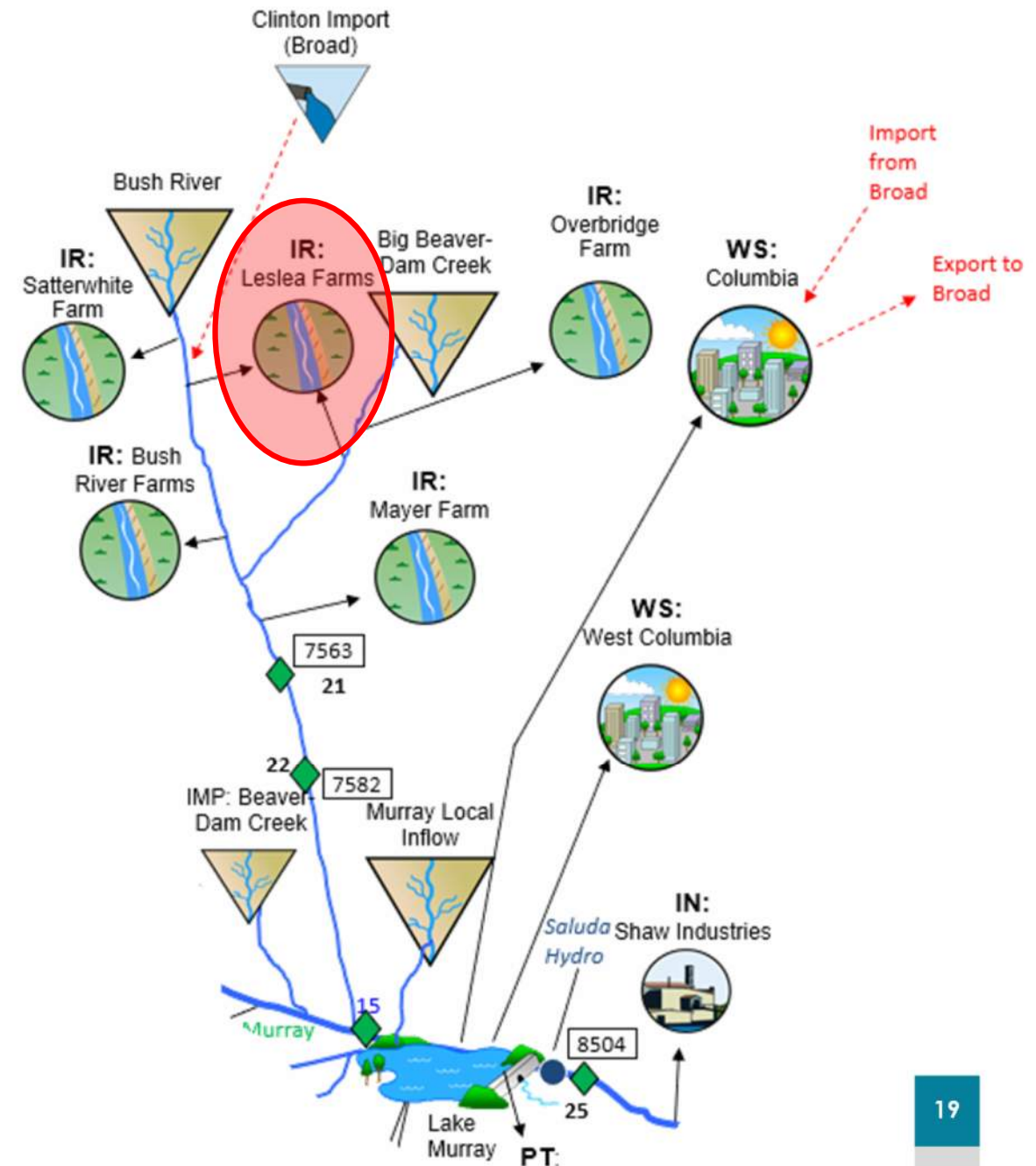
### Surface Water Shortage Table

Map ID	Water User	Max Shortage (MGD)	Frequency of Shortage
1	IR: Overbridge Farm	0.03	0.2%
2	IR: Leslea Farms	0.02	0.1%
3	IR: Watson Jerrold Farm	0.9	14%
4	IR: Titan Farms	1.5	9%

# IR: Leslea Farms

## Impoundments totaling 9 acres

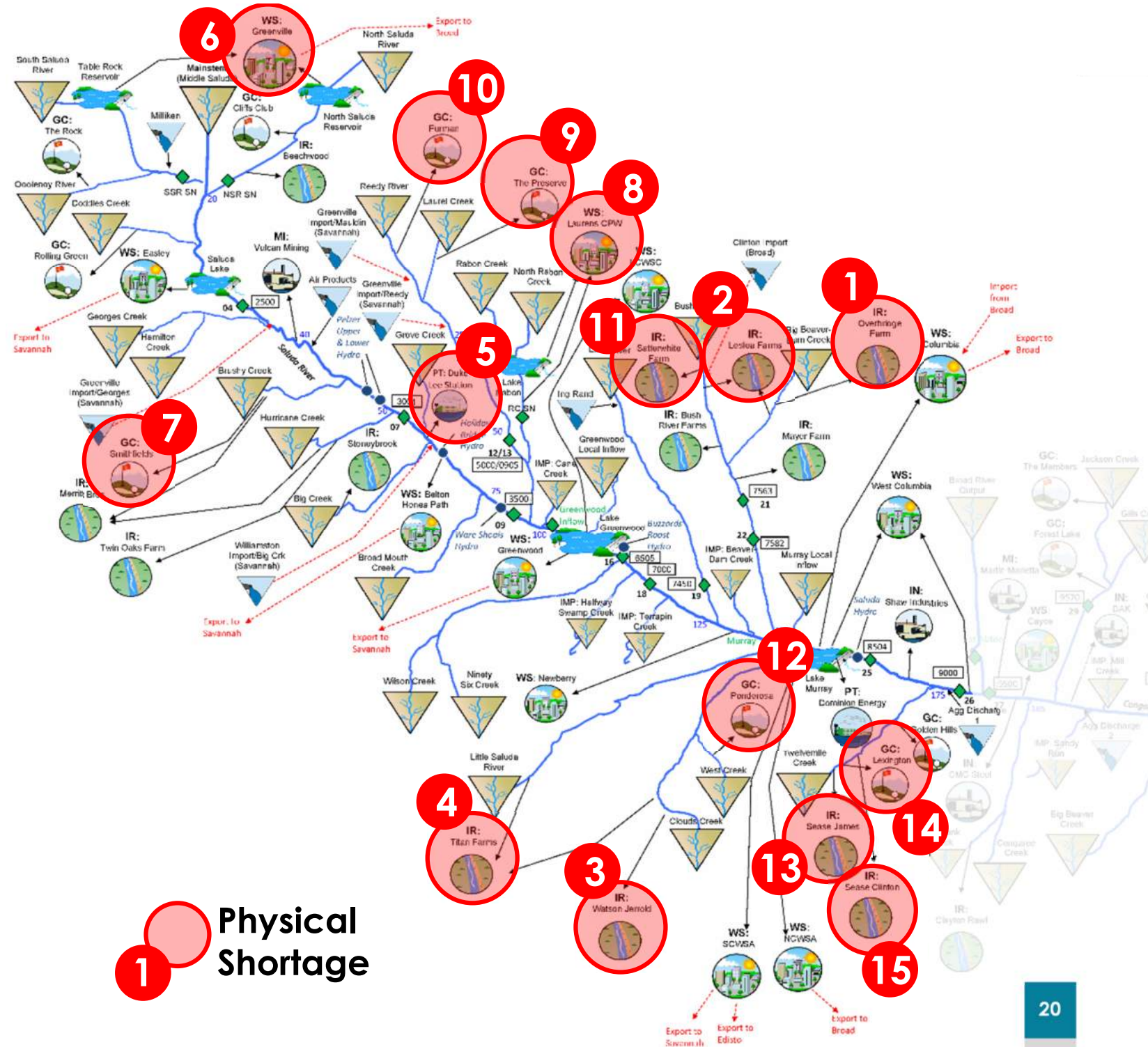
*Surface water user with storage not included in the model*



# Permitted & Registered Scenario

## Surface Water Shortage Table

Map ID	Water User	Max Shortage (MGD)	Frequency of Shortage
1	IR: Overbridge Farm	0.3	5%
2	IR: Leslea Farms	0.5	9%
3	IR: Watson Jerrold	5.9	76%
4	IR: Titan Farms	3.0	40%
5	PT: Duke Lee Station	295	38%
6	WS: Greenville	90	94%
7	GC: Smithfields	1.4	6%
8	WS: Laurens CPW	66	69%
9	GC: The Preserve	1.3	8%
10	GC: Furman	1.3	6%
11	IR: Satterwhite Farm	0.1	0.1%
12	GC: Ponderosa	0.6	0.2%
13	IR: Sease James	0.9	0.9%
14	GC: Lexington	0.03	0.1%
15	IR: Sease Clinton	0.7	0.9%



## Summary of Water Supply Shortages

Supply Shortage Metric	Current Use	Permitted & Registered
Total basin annual mean shortage (MGD)	0.09	99.5
Maximum water user shortage (MGD)	1.5	295.1
Total basin annual mean shortage as a percentage of total water demand	0.03%	7.8%
Percentage of surface water users experiencing a shortage	13.5%	43.2%
Average frequency of shortage (%)	0.6%	9.8%

*This is Table 3 of the memo*



# Strategic Nodes

South Saluda River (SSR SN)

North Saluda River (NSR SN)

SLD11 Reedy River above Fork Shoals

Rabon Creek (RC SN)

SLD04 Saluda River near Greenville

SLD07 Saluda River near Williamston

SLD09 Saluda River near Ware Shoals

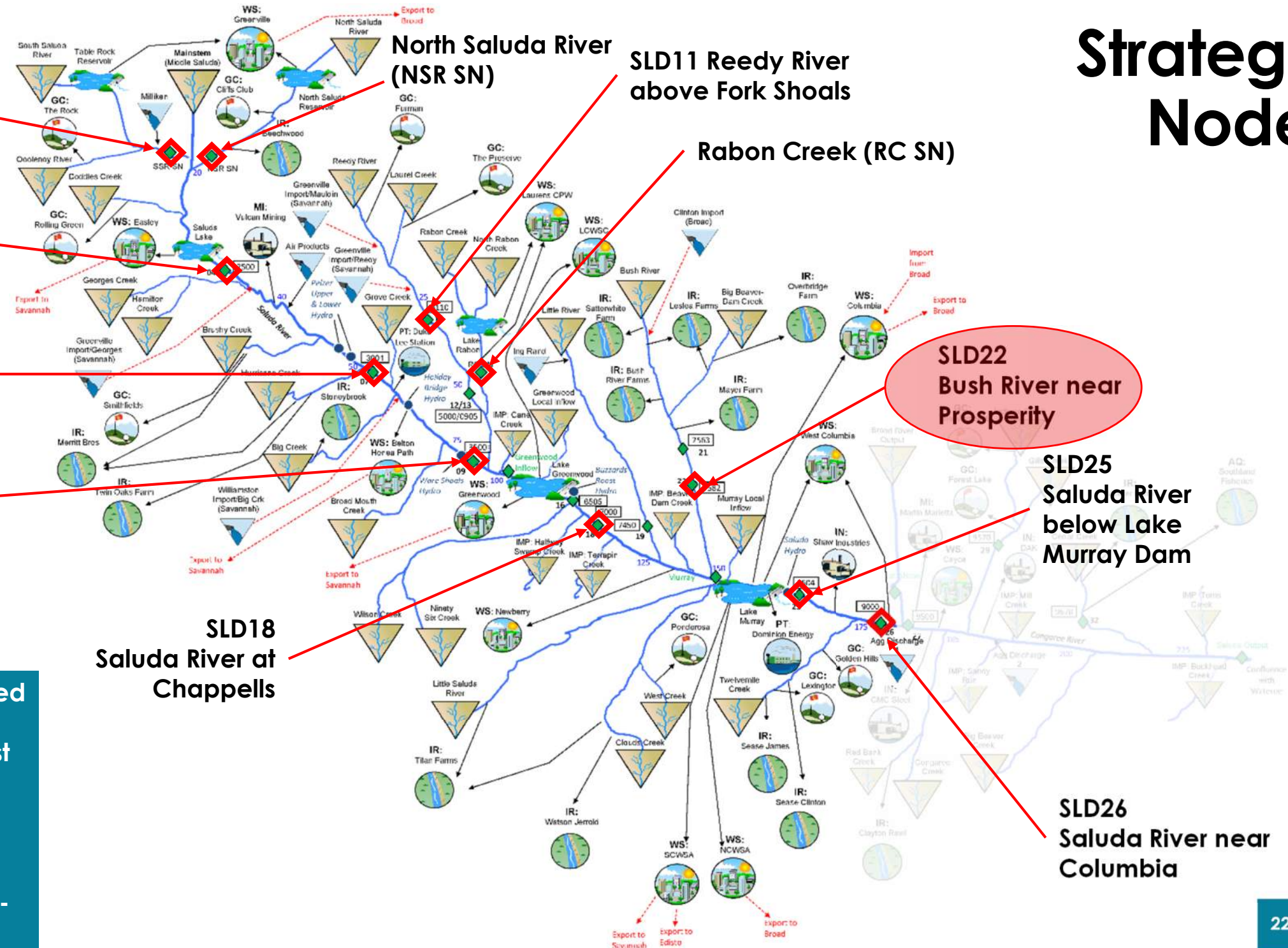
SLD22 Bush River near Prosperity

SLD25 Saluda River below Lake Murray Dam

SLD18 Saluda River at Chappells

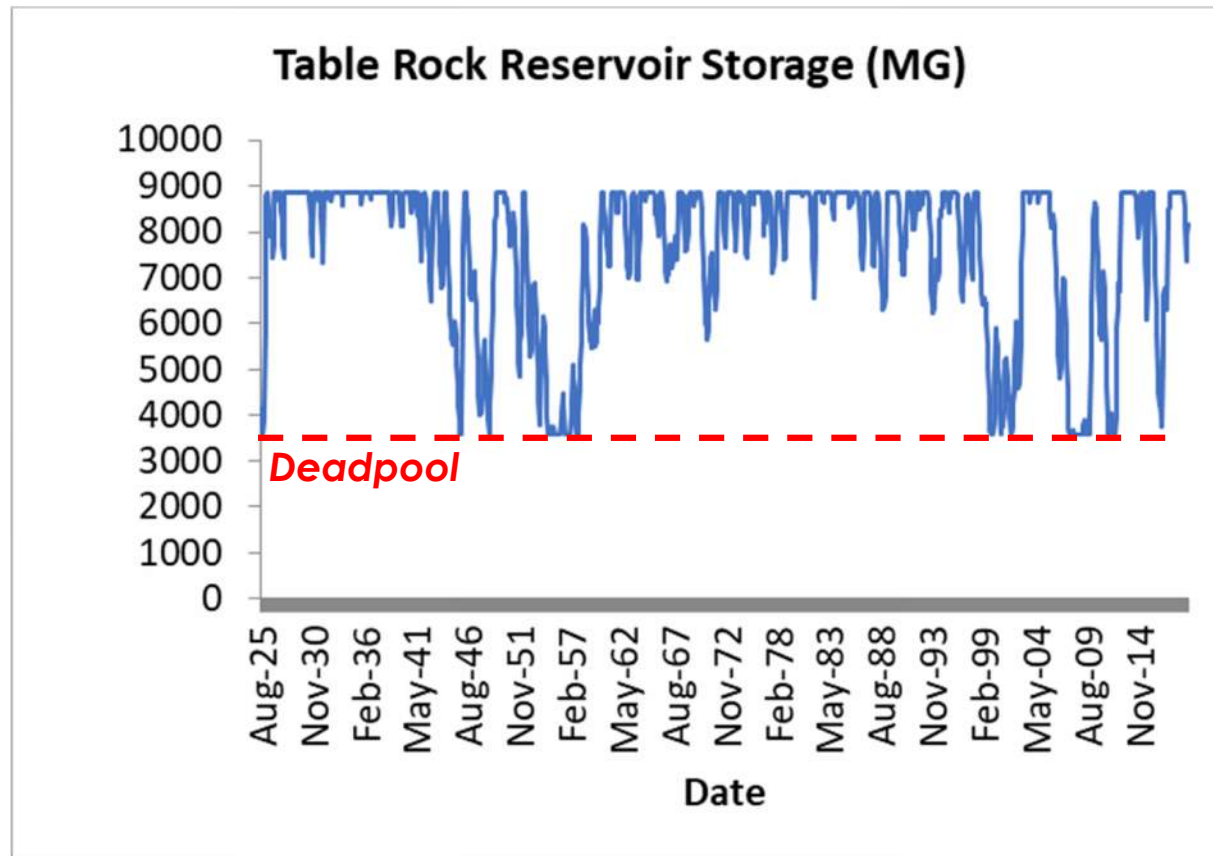
SLD26 Saluda River near Columbia

Strategic nodes are located on all major streams and rivers, downstream of most withdrawals and discharges. For wadable streams, they also they represent potential locations to evaluate flow-ecology relationships.

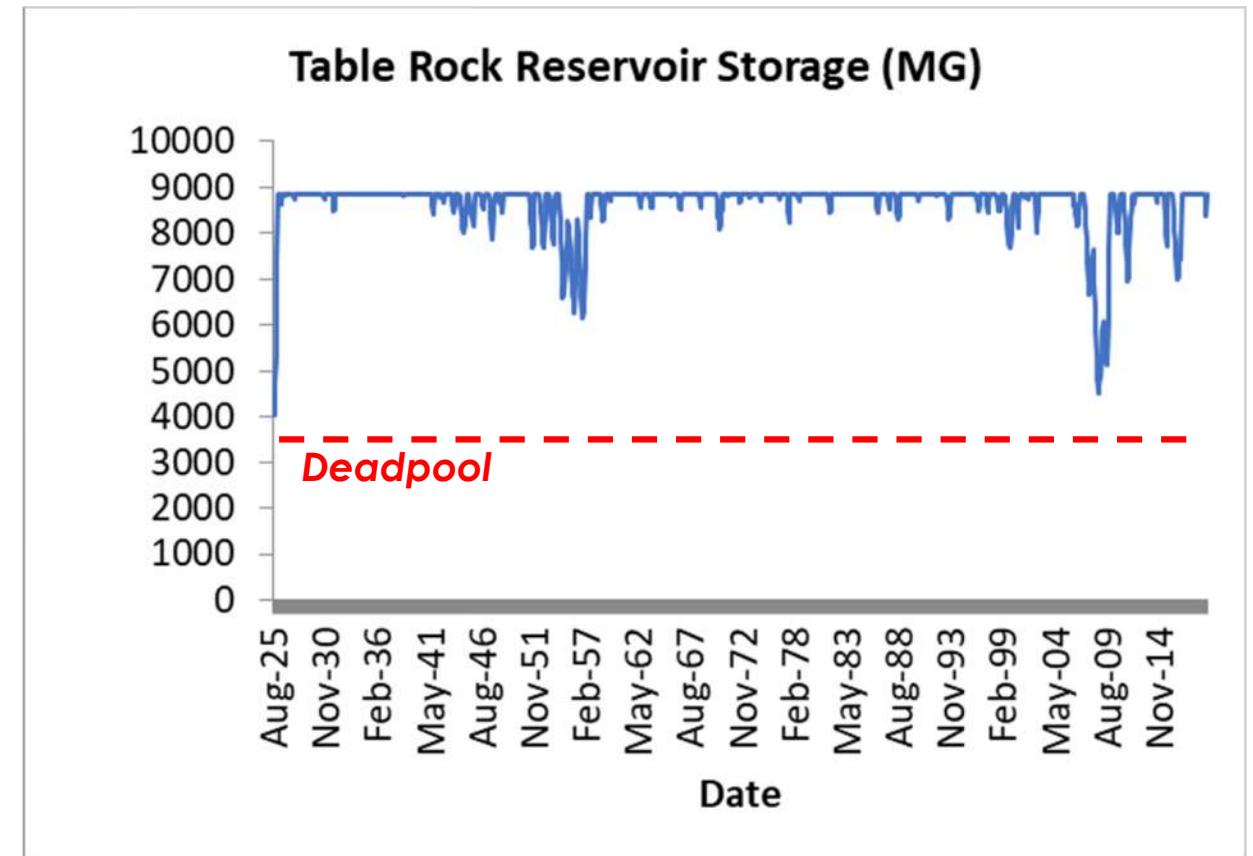


# Reservoir Storage – Table Rock Lake

## Current Use Scenario (before balancing)

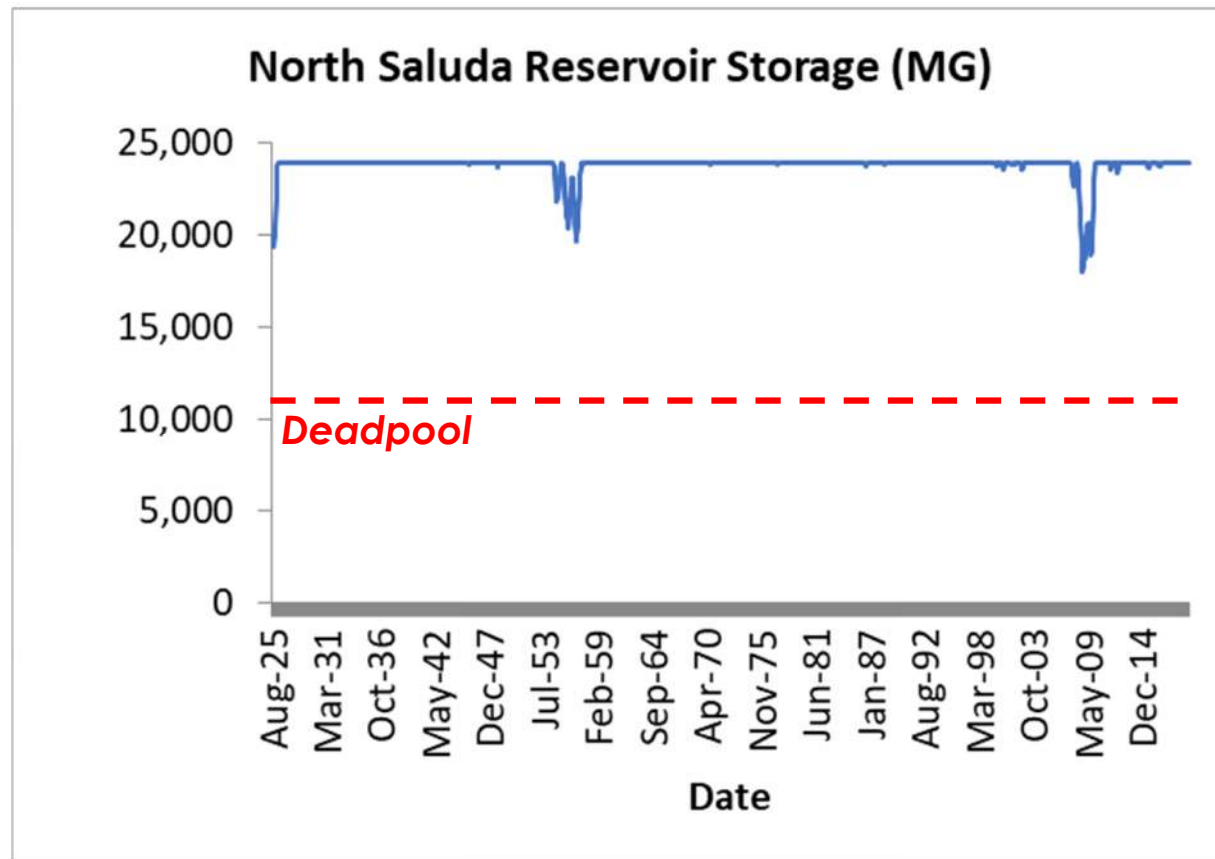


## Current Use Scenario (after balancing)

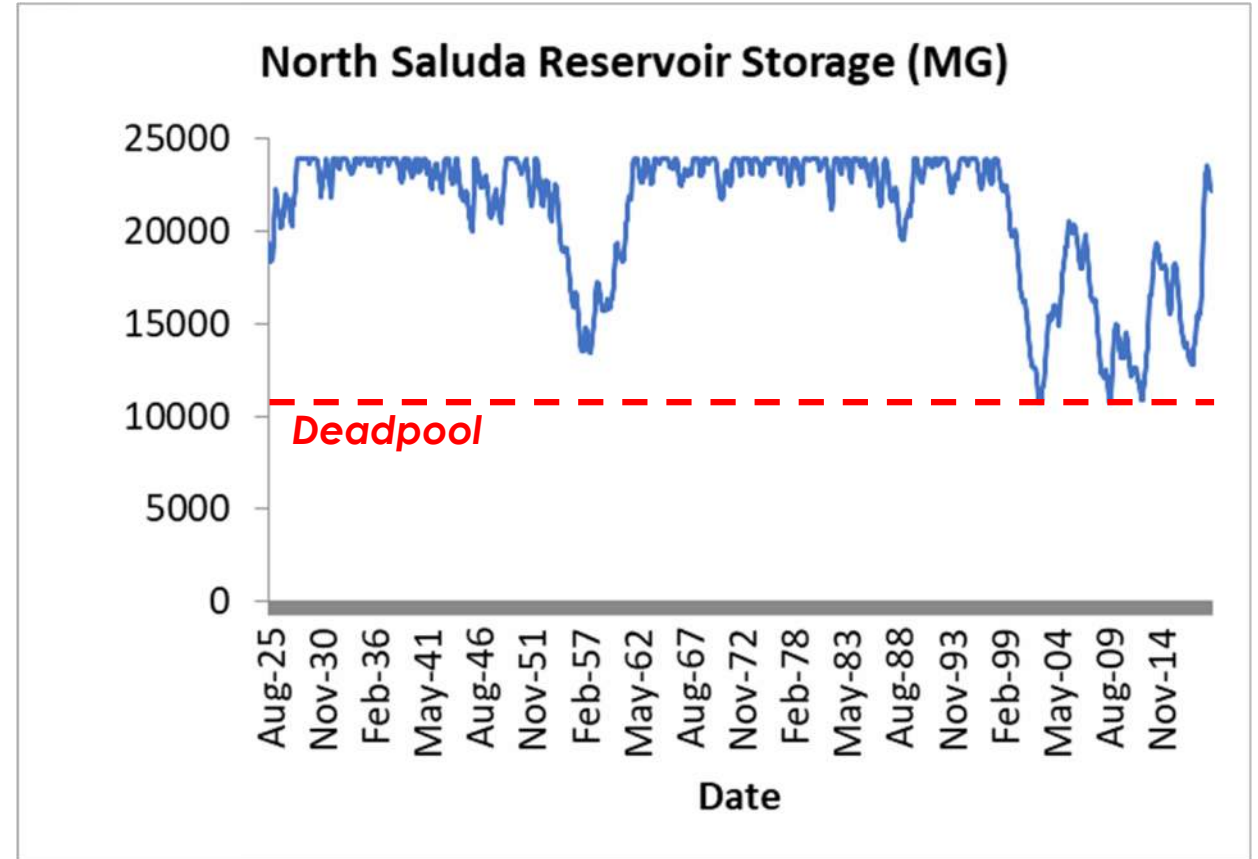


# Reservoir Storage – North Saluda Reservoir

## Current Use Scenario (before balancing)



## Current Use Scenario (after balancing)

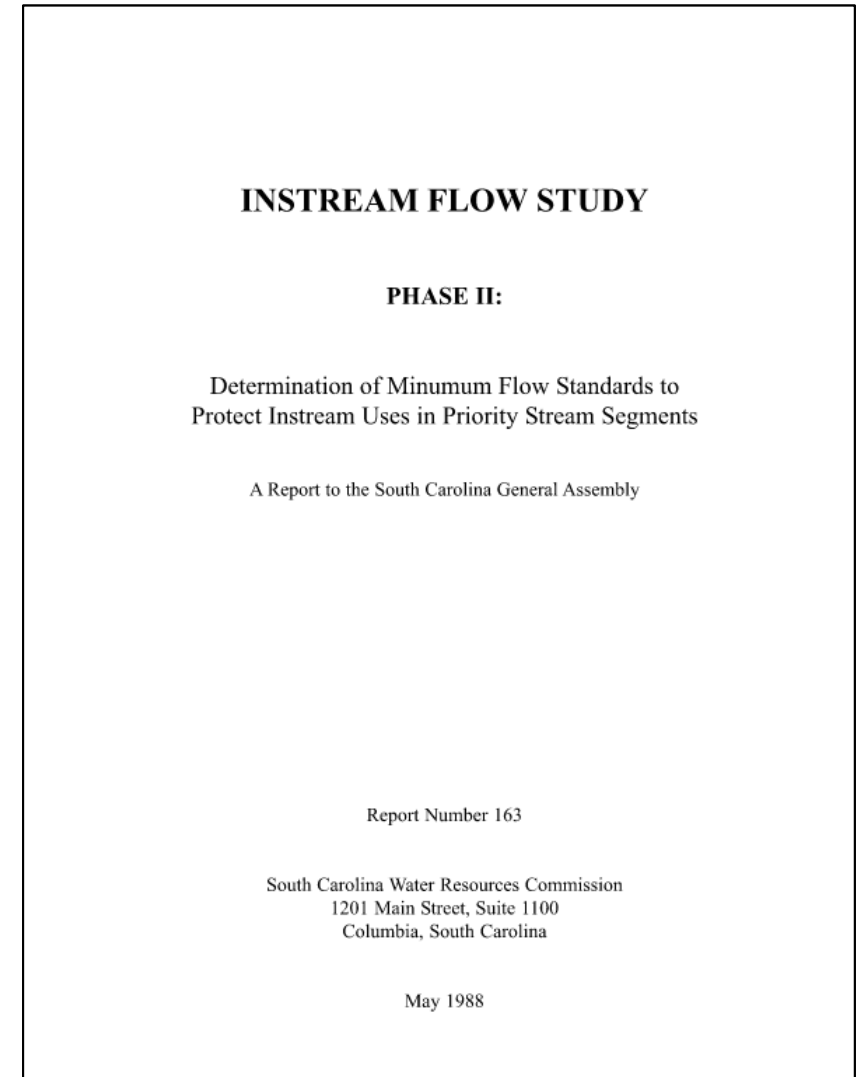




# Comparison to *Minimum Instream Flows*

# 1988 Instream Flow Study

- In 1983 the Water Resource Commission was directed to
  - **Phase 1:** Identify streams in need of low flow protection (1985)
  - **Phase II:** Make recommendations of MIF requirements to protect instream uses (1988)
- Determined MIF for 33 study sites based on 6 instream uses with different instream flow approaches
- MIF to protect fisheries resources determined by
  - Tennant Method
  - Wetted Perimeter
  - Usable Width
- Instream flows should be determined for 3 periods to maintain natural seasonal variability (higher flows in spring, lower in summer).
- SC Wildlife and Marine Resources Dept. used study to develop MIF for fisheries as 20-30-40



# 2009 SCDNR Instream Flow Policy

- Adopted results of 1988 study
  - Seasonal variability in flows
  - Fisheries requirements as limiting
- Based on variation in fish habitat needs in the Piedmont vs the Coastal Plain, DNR recommended MIFs vary
- DNR will request MIFs below proposed or existing dams be maintained at minimum levels noted in the table

Table VI. DNR recommended minimum acceptable instream flows.

Region	Period	Minimum Recommended Instream-Flow
Coastal Plain	July – November	20% of mean annual daily flow
	January – April	60% of mean annual daily flow
	May, June & December	40% of mean annual daily flow
Piedmont	July – November	20% of mean annual daily flow
	January – April	40% of mean annual daily flow
	May, June & December	30% of mean annual daily flow



DNR

## INSTREAM FLOWS TO PROTECT AQUATIC RESOURCES IN SOUTH CAROLINA

Minimum Instream-Flow Policy

Determination of General Instream-Flow Recommendations

March 2009

This document is available on the Department of Natural Resources web site at <http://www.dnr.sc.gov/>

# Minimum Instream Flows in the SW Regulations

The South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act defines the Minimum Instream Flow as:

“... the flow that provides an adequate supply of water at the surface water withdrawal point to maintain the biological, chemical, and physical integrity of the stream taking into account the needs of downstream users, recreation, and navigation and that flow is set at **forty percent** of the mean annual daily flow for the months of January, February, March, and April; **thirty percent** of the mean annual daily flow for the months of May, June, and December; and **twenty percent** of the mean annual daily flow for the months of July through November for surface water withdrawers as described in Section 49 4 150(A)(1).

For surface water withdrawal points located on a surface water segment downstream of and influenced by a licensed or otherwise flow controlled impoundment, “minimum instream flow” means the flow that provides an adequate supply of water at the surface water withdrawal point to maintain the biological, chemical, and physical integrity of the stream taking into account the needs of downstream users, recreation, and navigation and that flow is set in Section 49 4 150(A)(3).” *(which says that MIF shall be the flow specified in the license by the appropriate governmental agency)*

### Saluda River near Greenville (80 yrs)

UIF	2
Current	4
2070 Mod	--
2070 HD	--
P&R	10

### Saluda River near Williamston (27 yrs)

UIF	1
Current	2
2070 Mod	--
2070 HD	--
P&R	5

### Saluda River near Ware Shoals (83 yrs)

UIF	2
Current	3
2070 Mod	--
2070 HD	--
P&R	58

Percent of days below MIF for the location

### Reedy River above Fork Shoals (29 yrs)

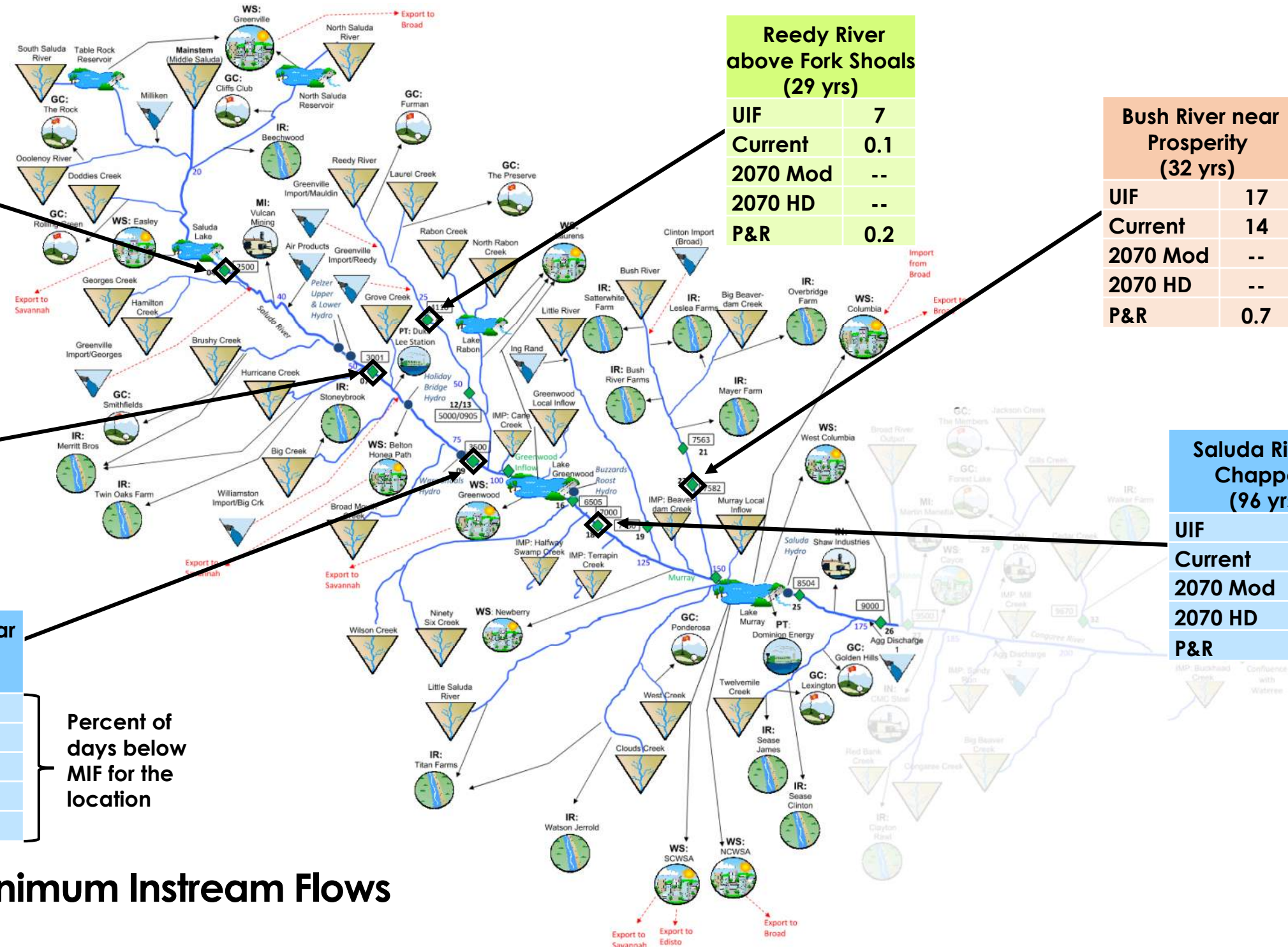
UIF	7
Current	0.1
2070 Mod	--
2070 HD	--
P&R	0.2

### Bush River near Prosperity (32 yrs)

UIF	17
Current	14
2070 Mod	--
2070 HD	--
P&R	0.7

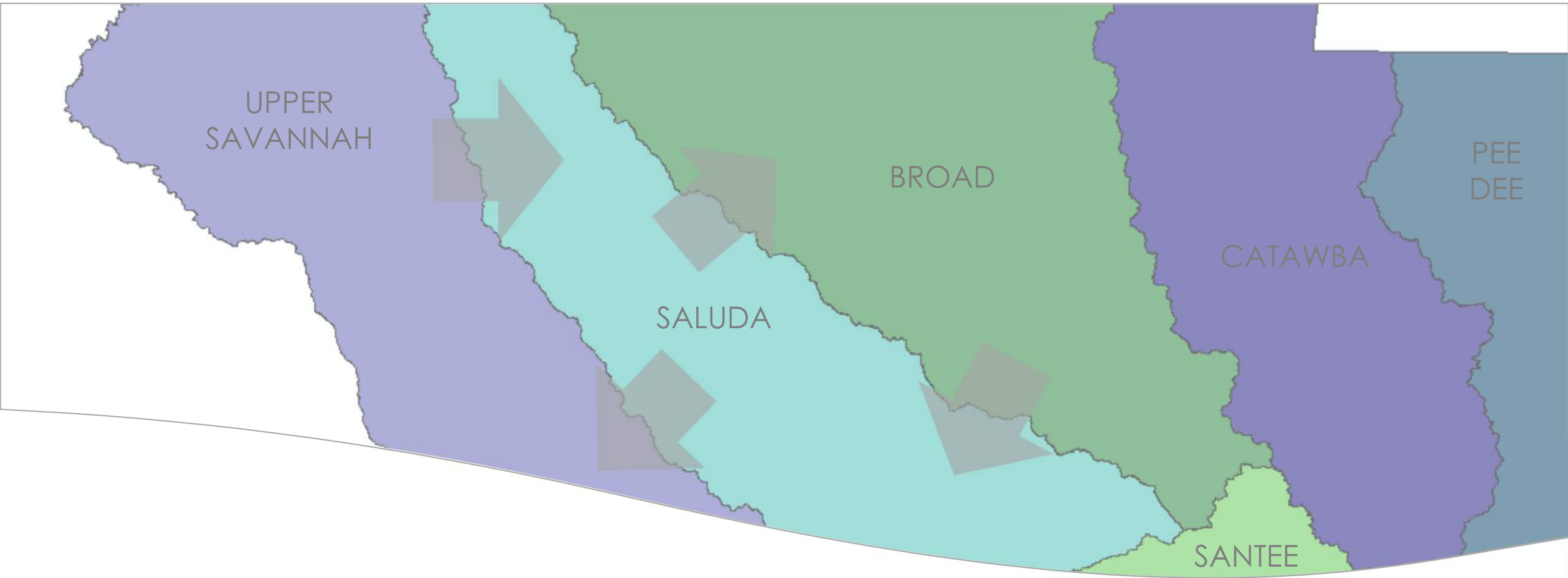
### Saluda River at Chappells (96 yrs)

UIF	5
Current	8
2070 Mod	--
2070 HD	--
P&R	43



# Comparison to Minimum Instream Flows Saluda River Basin

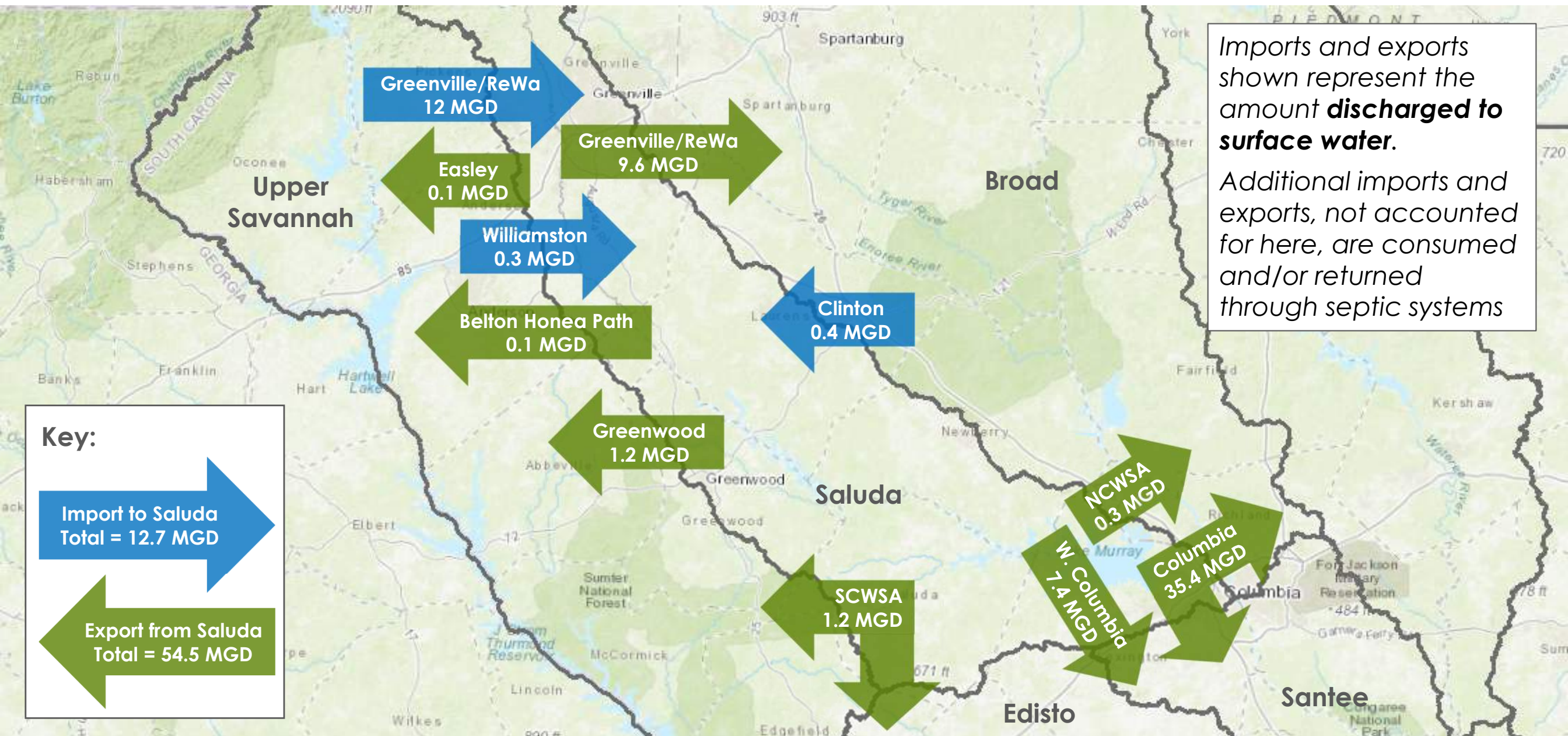




# Summary of Interbasin Transfers

# Saluda River Basin – Interbasin Transfers

## Current Use Scenario Imports and Exports



# Next Steps

- Incorporate **Moderate** and **High Demand Projections** and present these Scenario Results at the November RBC Meeting.
- Apply **flow-ecology metrics** then evaluate them using SWAM model daily timestep results for each planning scenario (RBC, CDM Smith, TNC, Clemson)
- Other actions, as identified by RBC