Surface Water Modeling
Scenario Results – August 2021

Objectives for Today

1. Review and understand the surface water modeling results

2. Review and understand the results of the flow-biological health study

3. Based on the results, does the RBC want to identify:

   a. Reaches of Interest?

   b. Surface Water Conditions?

4. Determine what we want to address with possible management strategies

5. Decide if more data, data analysis, or modeling is needed to fully consider items 3 and 4.

Requests for Additional Data, Analysis, or Modeling

1.

2.

3.

4.

5.

Definitions

Reaches of Interest are defined as specific stream reaches that may have no identified **Surface Water Shortage** but experience undesired impacts, environmental or otherwise, determined from current or future water-demand scenarios or proposed water management strategies.
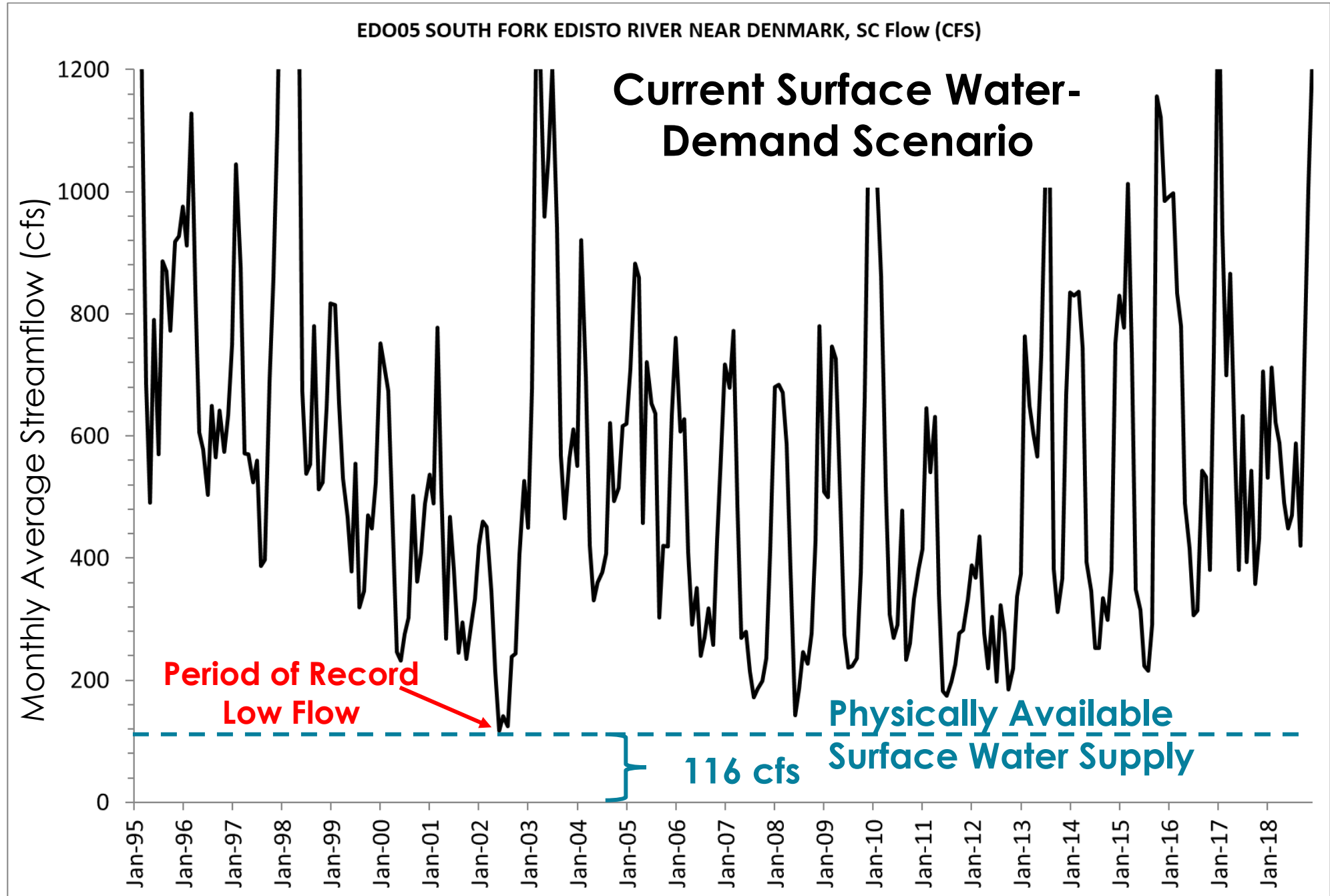
The designation of a *Reach of Interest* must be agreed upon by the RBC and may be related to recreational flows or in-stream flow considerations.
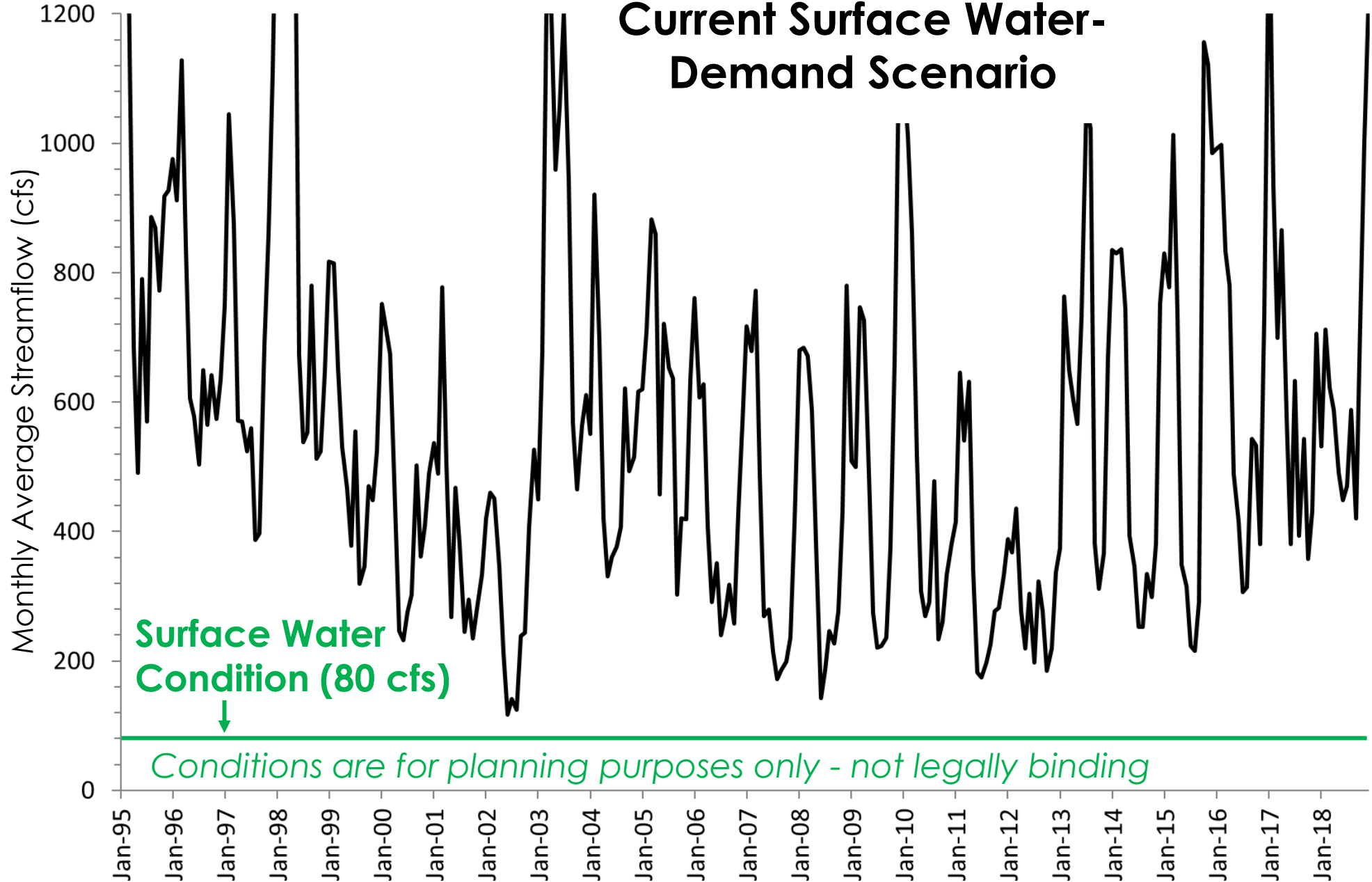
Definitions

A *Surface Water Condition* is a limitation, defined by the RBC, on the amount of water that can be withdrawn from a surface water source, and which can be applied to evaluate *Surface Water Supply* for planning purposes.

Surface Water Supply is the maximum amount of water available for withdrawal 100% of the time at a location on a surface water body without violating any applied **Surface Water Conditions** on the surface water source and considering upstream demands.

EDO05 SOUTH FORK EDISTO RIVER NEAR DENMARK, SC Flow (CFS)

Current Surface Water-Demand Scenario

EXAMPLE ONLY

Monthly Average Streamflow (cfs)

Period of Record Low Flow

Physically Available Surface Water Supply

116 cfs

EDO05 SOUTH FORK EDISTO RIVER NEAR DENMARK, SC Flow (CFS)

Current Surface Water-Demand Scenario

EXAMPLE ONLY

Surface Water Condition (80 cfs)

Conditions are for planning purposes only - not legally binding

EDO05 SOUTH FORK EDISTO RIVER NEAR DENMARK, SC Flow (CFS)

Current Surface Water-Demand Scenario

EXAMPLE ONLY

Monthly Average Streamflow (cfs)

Surface Water Condition (80 cfs)

Surface Water Supply (36 cfs)

Conditions are for planning purposes only - not legally binding

EDO05 SOUTH FORK EDISTO RIVER NEAR DENMARK, SC Flow (CFS)

50-year Water-Demand Projection

EXAMPLE ONLY

Monthly Average Streamflow (cfs)

Surface Water Condition (80 cfs)

Flow is 57 cfs
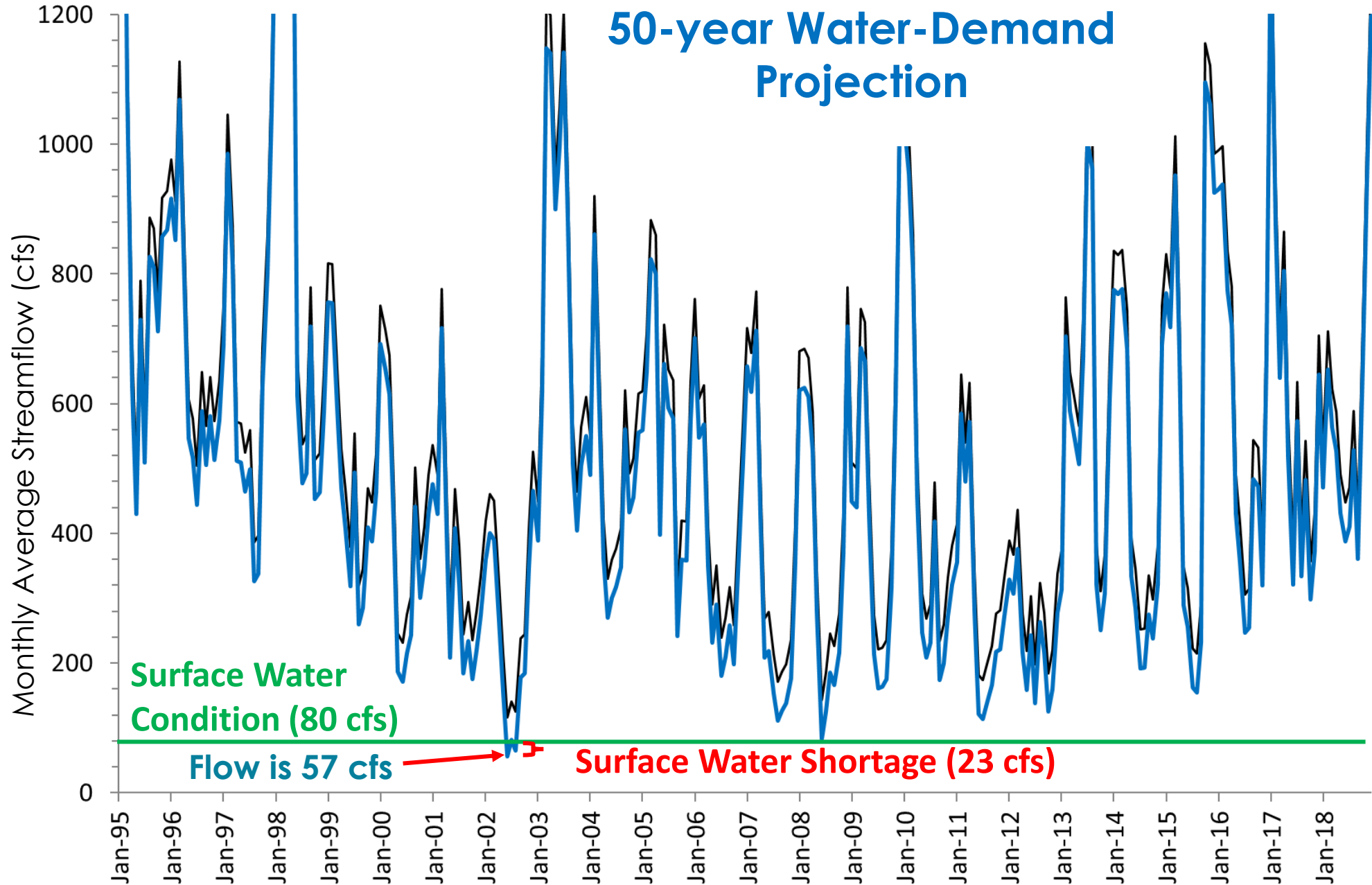
Surface Water Shortage (23 cfs)

Understanding the Results of the Surface Water Modeling Scenarios:

- Simulated **water shortages** are shown for each scenario

- Various **Performance measures** are provided, including:

  - Standard statistics (mean, median, and 25th, 10th and 5th percentile flows)

- **Low flow hydrographs** for all strategic nodes (**2002 drought**)

- **Flow-frequency plots** for all strategic nodes

All scenarios were run with no **surface water conditions.**

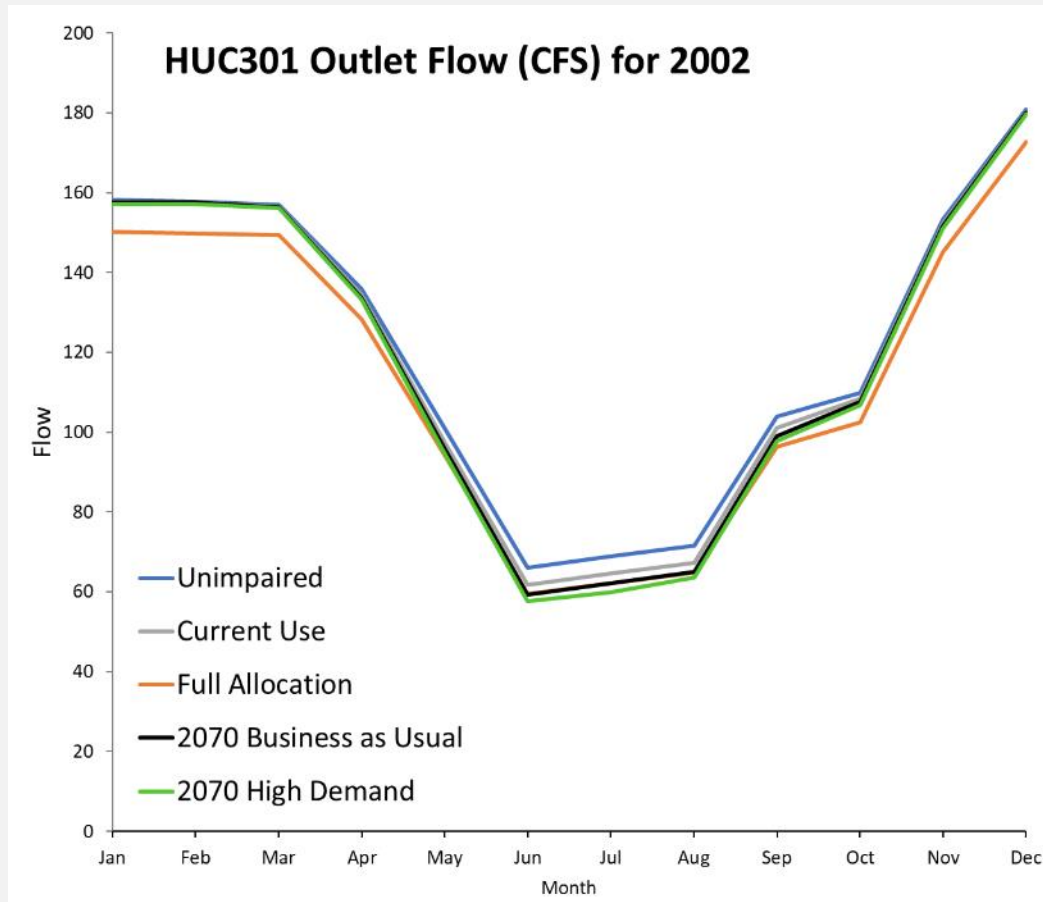# Understanding the Results of the Surface Water Modeling Scenarios:

- Various **Performance measures** are provided, including:
  - Standard statistics (mean, median, and 25th, 10th and 5th percentile flows)

Current Use Scenario

Unimpaired (Naturalized) Flow Scenario

Business-as-Usual Scenario 2070 Demands

High Demand Scenario 2070 Demands

Fully Permitted and Registered Scenario

HUC301 Outlet	Current Use	UIF	BAU 2070	HD 2070	Full Allocation
mean flow (cfs)	254	257	253	252	248
median flow (cfs)	229	232	229	228	224
25th percentile flow (cfs)	169	172	167	166	164
10th percentile flow (cfs)	125	128	123	122	120
5th percentile flow (cfs)	107	110	105	104	103

Understanding the Results of the Surface Water Modeling Scenarios:

- **Low flow hydrographs** for all strategic nodes (**2002 drought**)

HUC301 Outlet Flow (CFS) for 2002

Legend:
— Unimpaired
— Current Use
— Full Allocation
— 2070 Business as Usual
— 2070 High Demand

These graphs depict and compare monthly model simulated flows during 2002 for all scenarios. 2002 generally had the lowest flows over the period of record, and those typically occurred in June and July.

# Summary of Water Shortages for each Planning Scenario

Frequency of Shortage

< 10% ☐

10-50% 🟧

> 50% 🟥

Summary of Supply Shortages

Total basin annual mean shortage	1.5 MGD
Maximum water user shortage	4.1 MGD
Total basin annual mean shortage	1.7%
Water users experiencing shortage	17.6%
Average frequency of shortage	16.7%

Period of record: 8/31 to 12/18 (1,049 months)

Surface Water Shortages
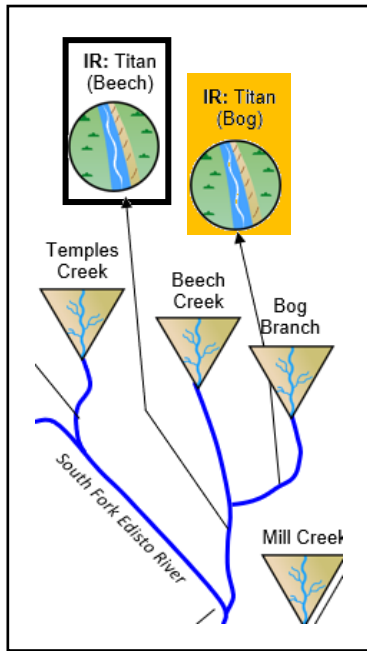## Current Conditions Water Use Scenario

Note: Only shortages are shown on the shortage tables. If a water user is not listed, then it was not simulated to have a shortage.

Water User Name	User Type	Source Water	Location (mi)	Average Annual Demand (MGD)	Minimum Physically Available Flow (MGD)	Average Shortage (MGD)	Maximum Shortage (MGD)	Frequency of Shortage (%)
IR: Titan - South Fork	Ag water user	Mainstem	6	2	3	0.00006	0.065	0.1%
IR: Titan - Temples	Ag water user	Temples Creek	2	2	0	0.51	3.5	35.1%
IR: Titan - Bog	Ag water user	Bog Branch	1	2	0	0.67	3.7	38.8%
IR: Titan - Beech	Ag water user	Beech Creek	5	1	1	0.01	0.9	2.2%
IR: Titan - Mill	Ag water user	Mill Creek	1	1	1	0.01	0.6	3.3%
IR: Titan - Beaverdam	Ag water user	Beaverdam Branch	1	0	0	0.04	0.7	17.9%
IR: Titan - Shaw	Ag water user	Shaw Creek	6	0	2	0.00	0.0	8.3%
IR: Shivers Trading	Ag water user	Sykes Swamp	0	0	0	0.03	0.4	19.1%
WS: Batesburg-Leesville	M&I water user	Lightwood Knot Creek	1	1	4	0.000	0.00	0.6%
IR: Millwood	Ag water user	Limestone Creek	6	3	2	0.12	4.1	6.7%
IR: Inabinet Farms	Ag water user	Caw Caw Swamp	1	0	5	0.00	0.0	14.5%
IR: Gray	Ag water user	Cooper Swamp	2	0	1	0.04	0.2	25.0%
IR: Titan - Chinquapin	Ag water user	North Fork Edisto R	1	0	1	0.01	0.9	4.0%
IR: Cotton Lane	Ag water user	Goodbys Swamp	2	0	0	0.00	0.2	1.7%
IR: Shady Grove	Ag water user	Cow Castle Creek	0	0	0	0.12	0.6	46.2%

Surface Water Shortages
Current Conditions Water Use Scenario

Titan Farms Bog Branch Example
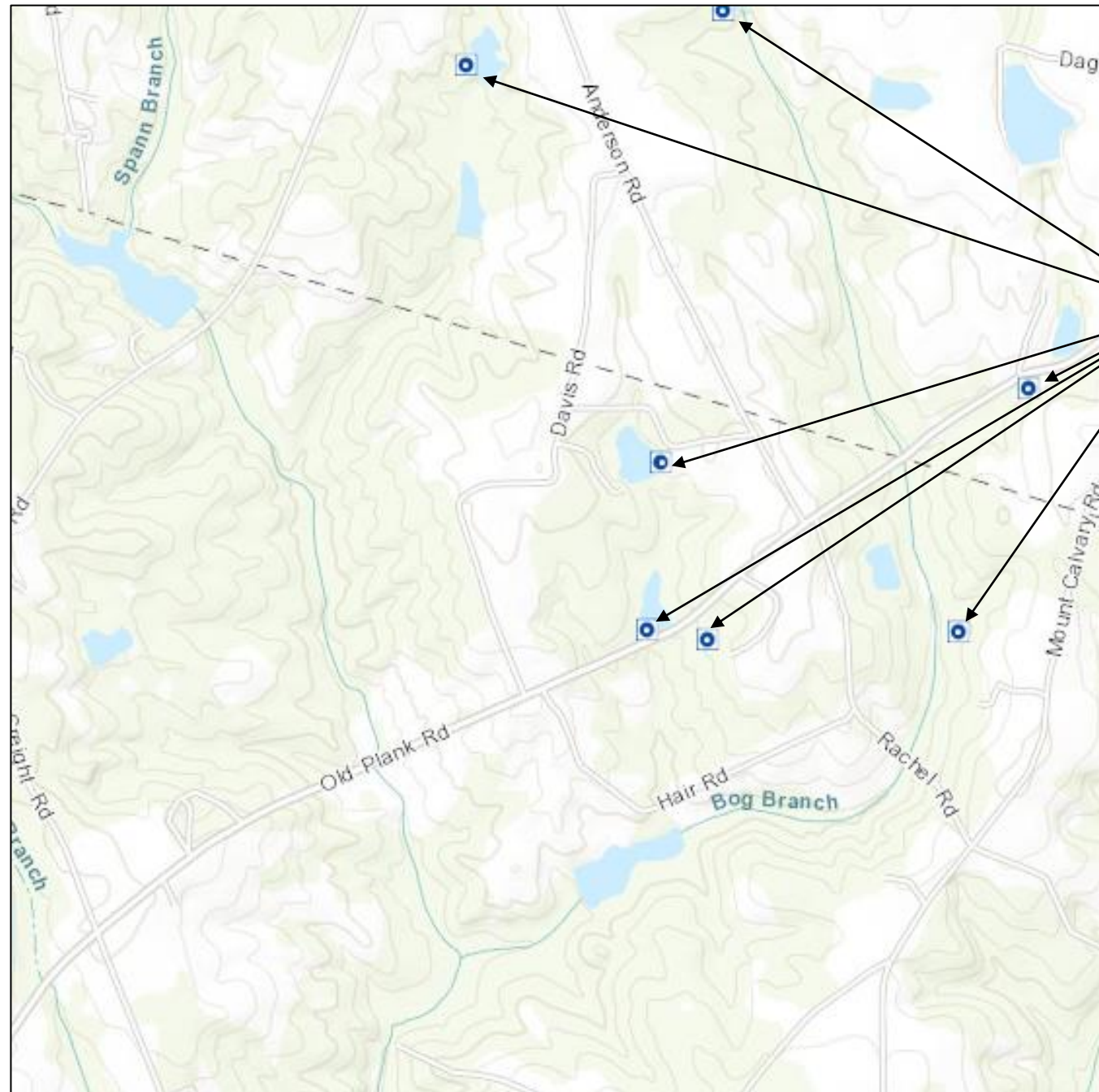
7 Withdrawal Locations

In the Model:

- 7 withdrawal locations are aggregated to 3

- All 3 are included on Bog Branch

- No pond storage is included

Surface Water Shortages
2070 Business as Usual Scenario

Frequency of Shortage

< 10% ☐

10-50% ▮ (orange)

> 50% ▮ (red)

Summary of Supply Shortages

Total basin annual mean shortage	1.5 MGD
Maximum water user shortage	4.1 MGD
Total basin annual mean shortage	1.0%
Water users experiencing shortage	15.8%
Average frequency of shortage	16.7%

Period of record: 8/31 to 12/18 (1,049 months)

Note: Only shortages are shown on the shortage tables. If a water user is not listed, then it was not simulated to have a shortage.
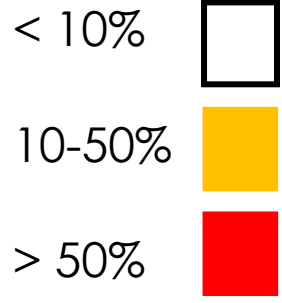
Water User Name	User Type	Source Water	Location (mi)	Average Annual Demand (MGD)	Minimum Physically Available Flow (MGD)	Average Shortage (MGD)	Maximum Shortage (MGD)	Frequency of Shortage (%)
IR: Titan - South Fork	Ag water user	Mainstem	6	2	3	0.00006	0.1	0.1%
IR: Titan - Temples	Ag water user	Temples Creek	2	2	0	0.51	3.5	35.1%
IR: Titan - Bog	Ag water user	Bog Branch	1	2	0	0.67	3.7	38.8%
IR: Titan - Beech	Ag water user	Beech Creek	5	1	1	0.01	0.9	2.2%
IR: Titan - Mill	Ag water user	Mill Creek	1	1	1	0.01	0.6	3.3%
IR: Titan - Beaverdam	Ag water user	Beaverdam Branch	1	0	0	0.04	0.7	17.9%
IR: Titan - Shaw	Ag water user	Shaw Creek	6	0	2	0.00	0.0	8.3%
IR: Shivers Trading	Ag water user	Sykes Swamp	0	0	0	0.03	0.4	19.1%
IR: Millwood	Ag water user	Limestone Creek	6	3	2	0.12	4.1	6.7%
IR: Inabinet Farms	Ag water user	Caw Caw Swamp	1	0	5	0.00	0.0	14.5%
IR: Gray	Ag water user	Cooper Swamp	2	0	1	0.04	0.2	25.0%
IR: Titan - Chinquapin	Ag water user	North Fork Edisto R	1	0	1	0.01	0.9	4.0%
IR: Cotton Lane	Ag water user	Goodbys Swamp	2	0	0	0.00	0.2	1.7%
IR: Shady Grove	Ag water user	Cow Castle Creek	0	0	0	0.12	0.6	46.2%

Note: The shortages listed for Ag water users here and in the other scenarios are nearly identical to the Current Use Scenario since Ag demands remain the same for each registered Ag user.
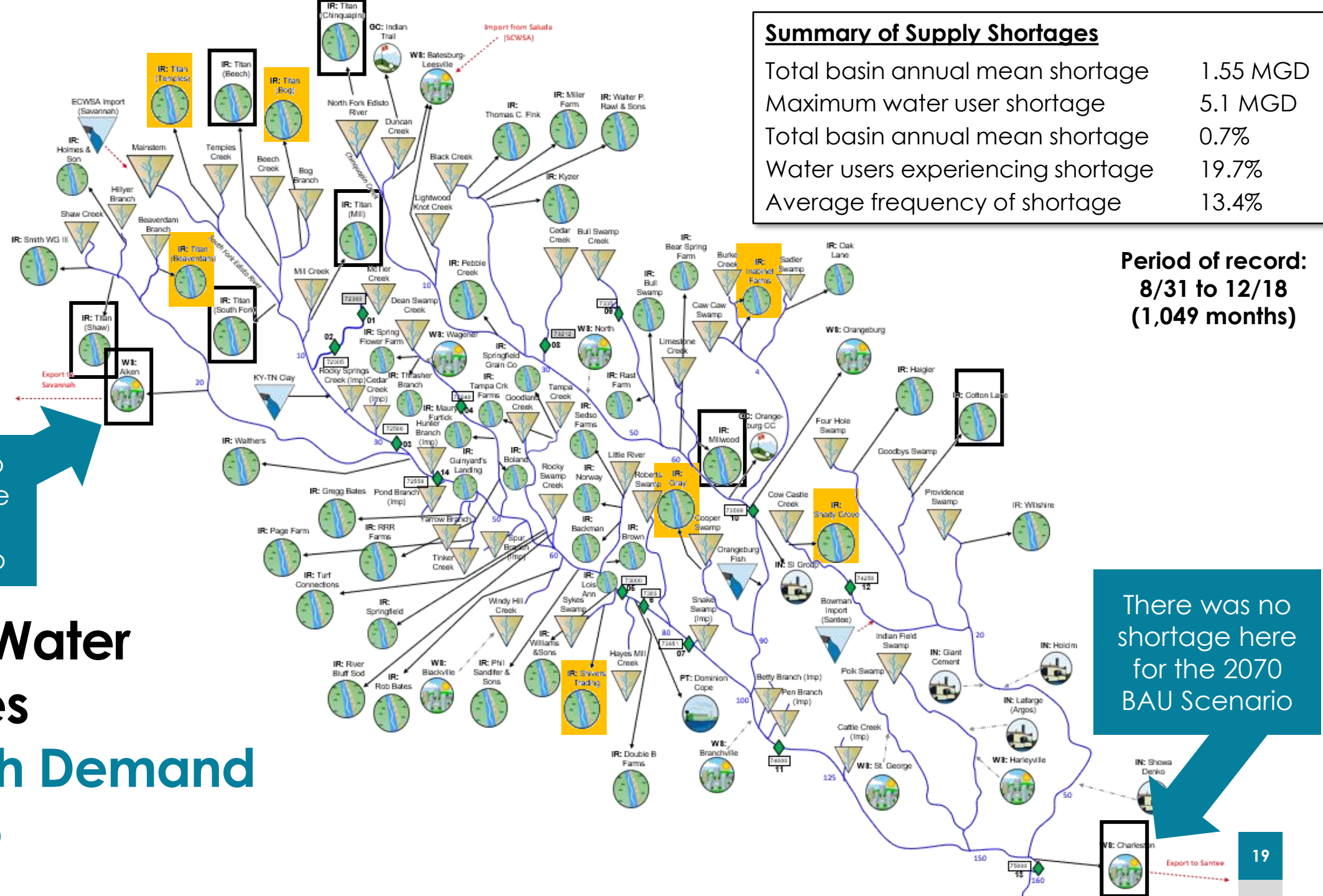
Surface Water Shortages
2070 Business as Usual Scenario

Surface Water Shortages
2070 High Demand Scenario

Frequency of Shortage

< 10%

10-50%

> 50%

Summary of Supply Shortages

Total basin annual mean shortage	1.55 MGD
Maximum water user shortage	5.1 MGD
Total basin annual mean shortage	0.7%
Water users experiencing shortage	19.7%
Average frequency of shortage	13.4%

Period of record: 8/31 to 12/18 (1,049 months)

There was no shortage here for the 2070 BAU Scenario

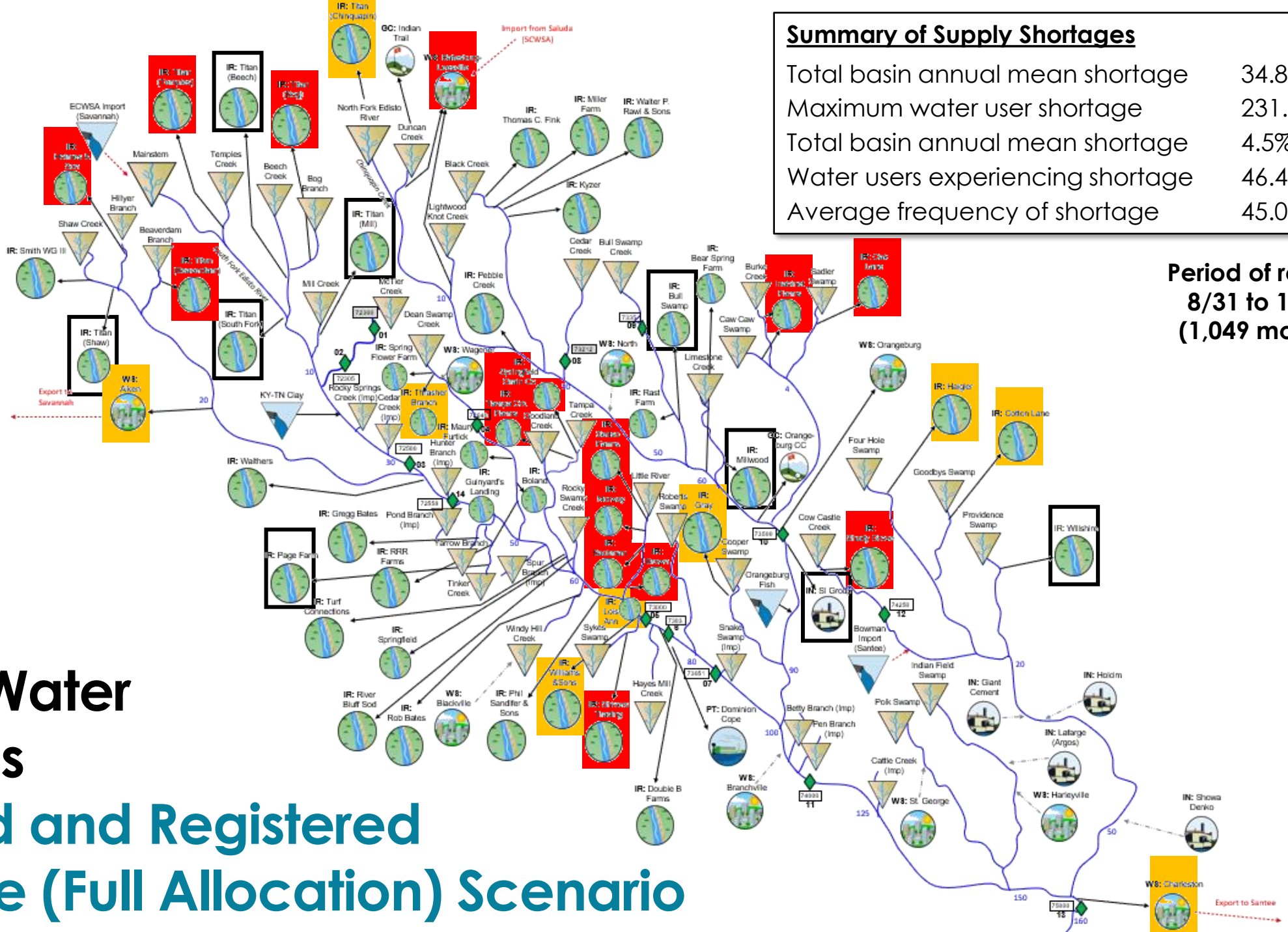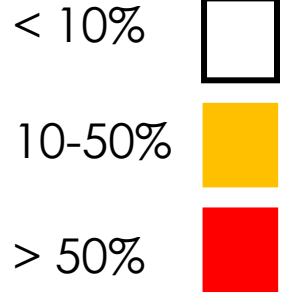There was no shortage here for the 2070 BAU Scenario

Note: Only shortages are shown on the shortage tables. If a water user is not listed, then it was not simulated to have a shortage.

Water User Name	User Type	Source Water	Location (mi)	Average Annual Demand (MGD)	Minimum Physically Available Flow (MGD)	Average Shortage (MGD)	Maximum Shortage (MGD)	Frequency of Shortage (%)
IR: Titan - South Fork	Ag water user	Mainstem	6	2	3	0.0	0.1	0.1%
WS: Charleston	M&I water user	Mainstem	159	133	142	0.0	5.1	0.2%
IR: Titan - Temples	Ag water user	Temples Creek	2	2	0	0.5	3.5	35.1%
IR: Titan - Bog	Ag water user	Bog Branch	1	2	0	0.7	3.7	38.8%
IR: Titan - Beech	Ag water user	Beech Creek	5	1	1	0.0	0.9	2.2%
IR: Titan - Mill	Ag water user	Mill Creek	1	1	1	0.0	0.6	3.3%
IR: Titan - Beaverdam	Ag water user	Beaverdam Branch	1	0	0	0.0	0.7	17.9%
IR: Titan - Shaw	Ag water user	Shaw Creek	6	0	2	0.0	0.0	8.3%
WS: Aiken	M&I water user	Shaw Creek	19	13	8	0.0	0.3	0.1%
IR: Shivers Trading	Ag water user	Sykes Swamp	0	0	0	0.0	0.4	19.1%
WS: Batesburg-Leesville	M&I water user	Lightwood Knot Creek	1	4	4	0.0	0.7	0.2%
IR: Millwood	Ag water user	Limestone Creek	6	3	2	0.1	4.1	6.7%
IR: Inabinet Farms	Ag water user	Caw Caw Swamp	1	0	5	0.0	0.0	14.5%
IR: Gray	Ag water user	Cooper Swamp	2	0	1	0.0	0.2	25.0%
IR: Titan - Chinquapin	Ag water user	North Fork Edisto R	1	0	1	0.0	0.9	4.0%
IR: Cotton Lane	Ag water user	Goodbys Swamp	2	0	0	0.0	0.2	1.7%
IR: Shady Grove	Ag water user	Cow Castle Creek	0	0	0	0.1	0.6	46.2%

Surface Water Shortages
2070 High Demand Scenario

Frequency of Shortage

< 10%

10-50%

> 50%

Summary of Supply Shortages

Total basin annual mean shortage	34.8 MGD
Maximum water user shortage	231.5 MGD
Total basin annual mean shortage	4.5%
Water users experiencing shortage	46.4%
Average frequency of shortage	45.0%

Period of record: 8/31 to 12/18 (1,049 months)

Surface Water Shortages
Permitted and Registered Water Use (Full Allocation) Scenario

Note: Only shortages are shown on the shortage tables. If a water user is not listed, then it was not simulated to have a shortage.

Water User Name	User Type	Source Water	Location (mi)	Average Annual Demand (MGD)	Minimum Physically Available Flow (MGD)	Average Shortage (MGD)	Maximum Shortage (MGD)	Frequency of Shortage (%)
IR: Titan - South Fork	Ag water user	Mainstem	6	4	3	0.0	0.9	0.5%
IR: Lois Ann	Ag water user	Mainstem	69	105	31	1.2	73.9	5.1%
IR: Williams & Sons	Ag water user	Mainstem	69	2	0	0.1	1.6	5.3%
WS: Charleston	M&I water user	Mainstem	159	287	59	13.1	231.5	12.4%
IR: Titan - Temples	Ag water user	Temples Creek	2	5	0	1.9	4.4	88.3%
IR: Titan - Bog	Ag water user	Bog Branch	1	7	0	4.3	6.4	99.9%
IR: Titan - Beech	Ag water user	Beech Creek	5	3	1	0.1	2.0	21.0%
IR: Titan - Mill	Ag water user	Mill Creek	1	1	1	0.0	0.6	5.1%
IR: Holmes & Son	Ag water user	Hillyer Branch	1	2	0	1.0	1.5	97.9%
IR: Titan - Beaverdam	Ag water user	Beaverdam Branch	1	1	0	0.2	0.7	60.0%
IR: Smith WG III	Ag water user	Shaw Creek	1	1	0	0.0	0.6	13.7%
WS: Aiken	M&I water user	Shaw Creek	19	15	8	0.0	0.4	16.7%
IR: Page Farm	Ag water user	Tinker Creek	1	0	0	0.0	0.0	0.4%
IR: Thrasher Branch	Ag water user	Dean Swamp Creek	1	6	2	0.1	3.7	10.2%
IR: Springfield Grain Co	Ag water user	Tampa Creek	1	3	0	1.6	2.9	94.8%
IR: Tampa Creek Farms	Ag water user	Tampa Creek	2	2	0	0.8	1.7	86.7%
IR: Sedso Farms	Ag water user	Little River	2	15	3	3.9	12.3	72.3%
IR: Brown	Ag water user	Little River	2	1	0	0.1	0.5	64.5%
IR: Norway	Ag water user	Little River	3	1	0	0.3	0.8	72.4%
IR: Backman	Ag water user	Little River	3	2	0	1.4	2.0	78.1%
IR: Shivers Trading	Ag water user	Sykes Swamp	0	1	0	0.2	0.6	70.0%
WS: Batesburg-Leesville	M&I water user	Lightwood Knot Creek	1	2	4	0.1	0.6	100.0%
IR: Bull Swamp	Ag water user	Bull Swamp Creek	13	1	1	0.0	0.2	0.1%
IR: Millwood	Ag water user	Limestone Creek	6	9	2	0.5	5.6	24.5%
IR: Oak Lane	Ag water user	Sadler Swamp	1	1	0	0.2	0.9	51.3%
IR: Inabinet Farms	Ag water user	Caw Caw Swamp	1	2	5	0.0	0.7	91.4%
IR: Titan - Chinquapin	Ag water user	North Fork Edisto R	1	2	1	0.1	1.5	27.8%
IN: SI Group	M&I water user	North Fork Edisto R	70	91	55	0.1	36.0	1.0%
IR: Cotton Lane	Ag water user	Goodbys Swamp	2	2	0	0.3	1.7	39.3%
IR: Shady Grove	Ag water user	Cow Castle Creek	0	3	0	2.5	3.5	95.9%
IR: Willshire	Ag water user	Providence Swamp	4	1	0	0.0	0.2	0.1%
IR: Haigler	Ag water user	Four Hole Swamp	2	5	0	0.7	4.5	33.7%

Surface Water Shortages
Permitted and Registered Water Use Full Allocation Scenario