Results of Additional Supply-Side Analysis

Grace Houghton, CDM Smith

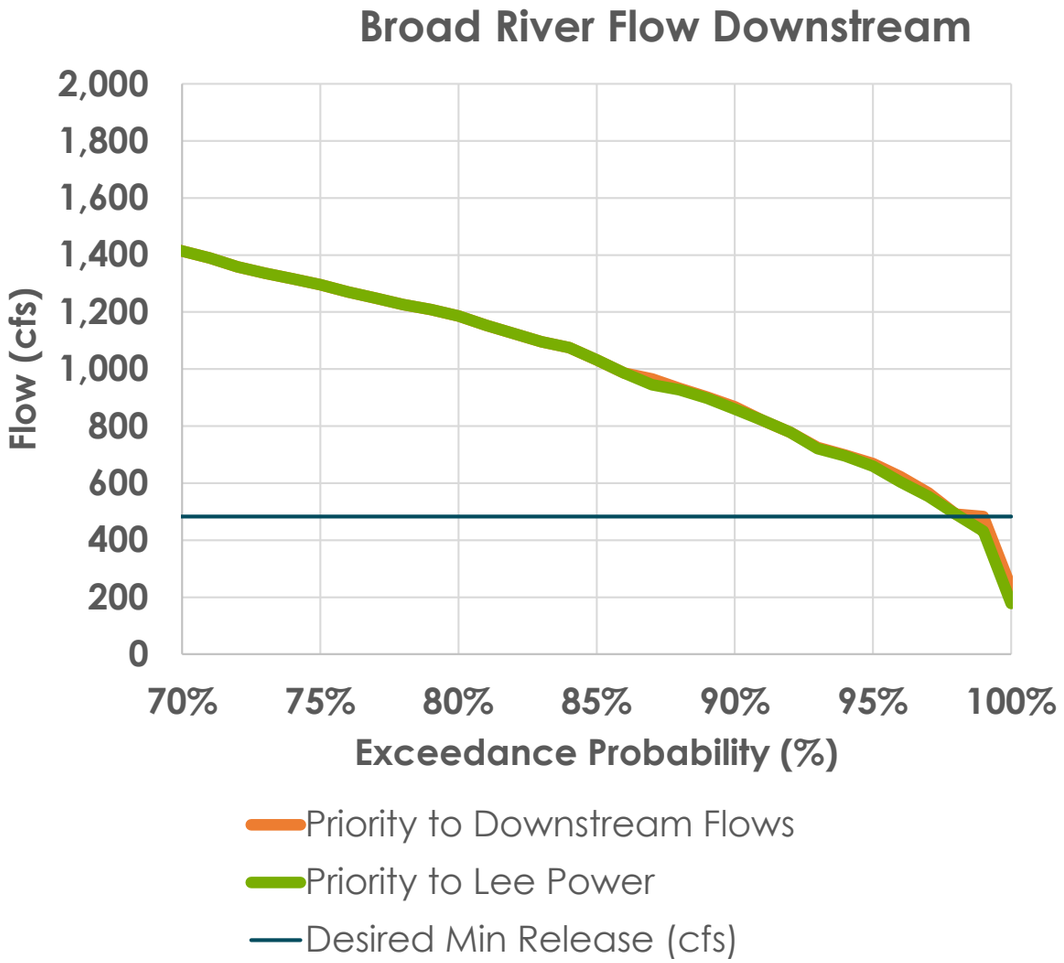
Agenda Item 4

Lee Nuclear Site at Ninety–Nine Islands

Special Modeling Scenario

Lee Nuclear Site Operations and Impacts

	Lee Nuclear Site Shortage (MGD)		BR03 Flow (cfs) Downstream of Ninety-Nine Islands	
	Priority to Downstream Flows	Priority to Lee	Priority to Downstream Flows	Priority to Lee
Min	0	0	232	178
Avg	0.6	0	2,197	2,196
Max	36	0	6,468	6,468
Frequency (%)	3.0%	0%	-	-

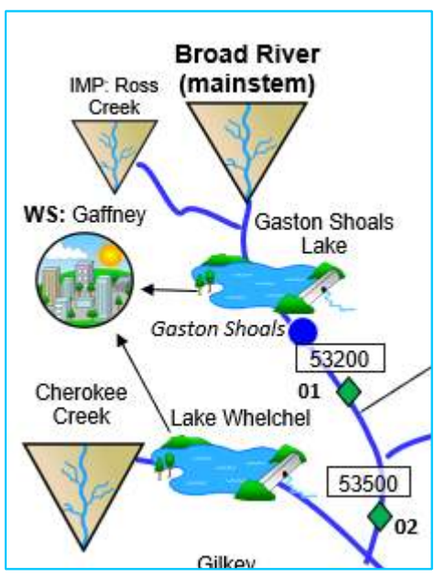


Lee Nuclear Site's demand can be satisfied with minimal impact to flows downstream of Ninety-Nine Islands.

Gaffney Supply Alternatives

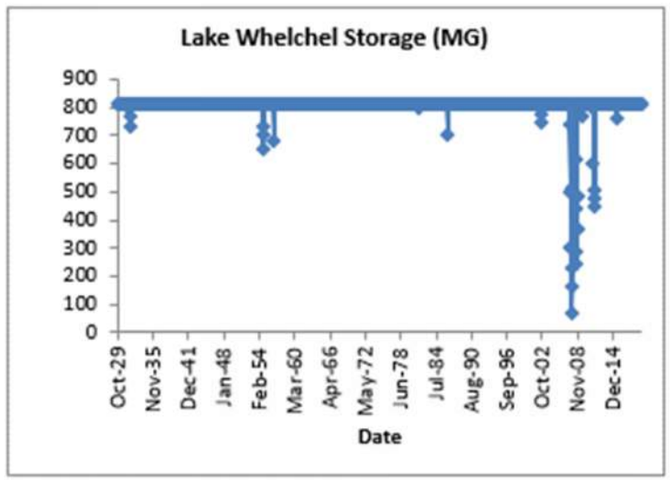
Safe Yield for Gaffney

Reservoir	Safe Yield (MGD)
Lake Whelchel	6.8
Gaston Shoals (FERC allowance)	6.0
Combined	12.8
Prior Total System Assessment (AECOM)	12.7

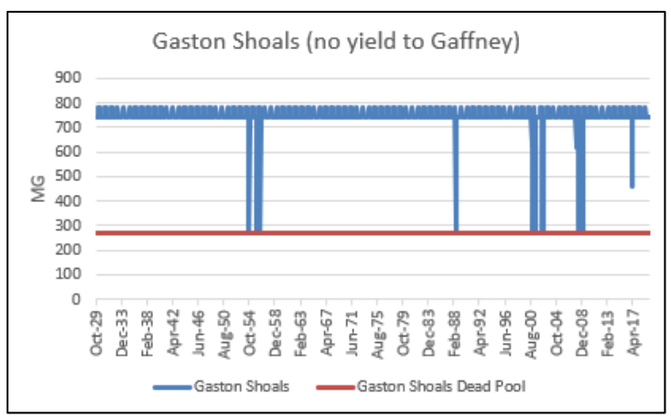


No upstream SC users, so demand scenario doesn't matter

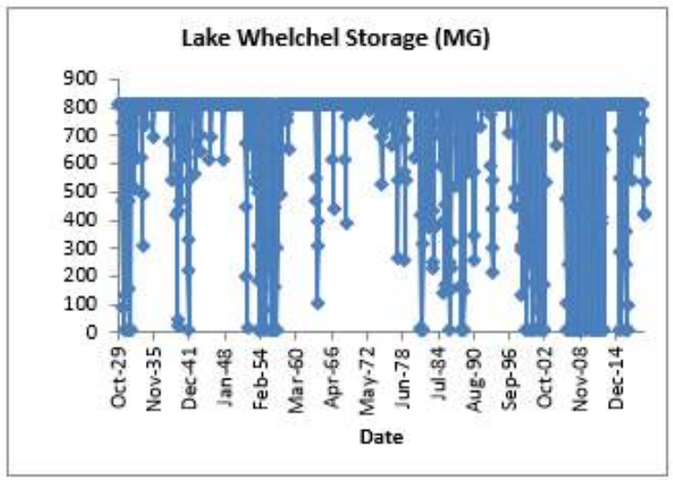
Lake Whelchel Yield of 6.8 MGD

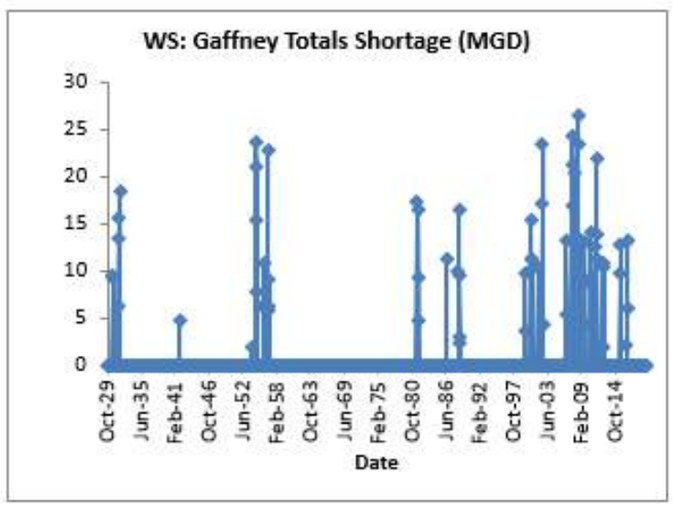


Gaston Shoals with Only Downstream Releases



System at 25 MGD 2070 High Demand

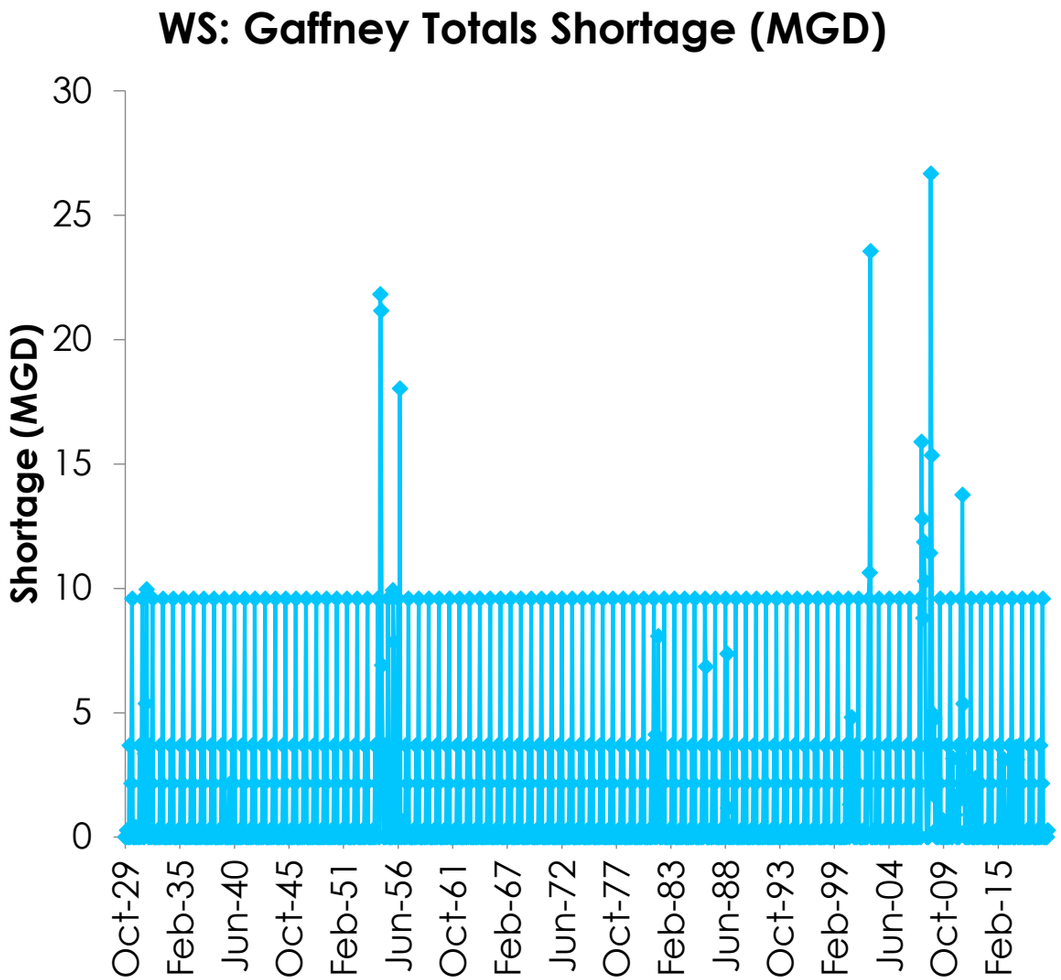




Gaffney Projected 2070 High Demand Shortages

	2070 High Demand Projection
Average Shortage (MGD)	1.6
Max Shortage (MGD)	26.7
Frequency of Shortage (%)	37.4%

- Lake Whelchel:
  - 651 MGM
- Gaston Shoals:
  - 620 MGM DHEC permit
  - **6 MGD annual average** from Gaston Shoals (FERC limit)

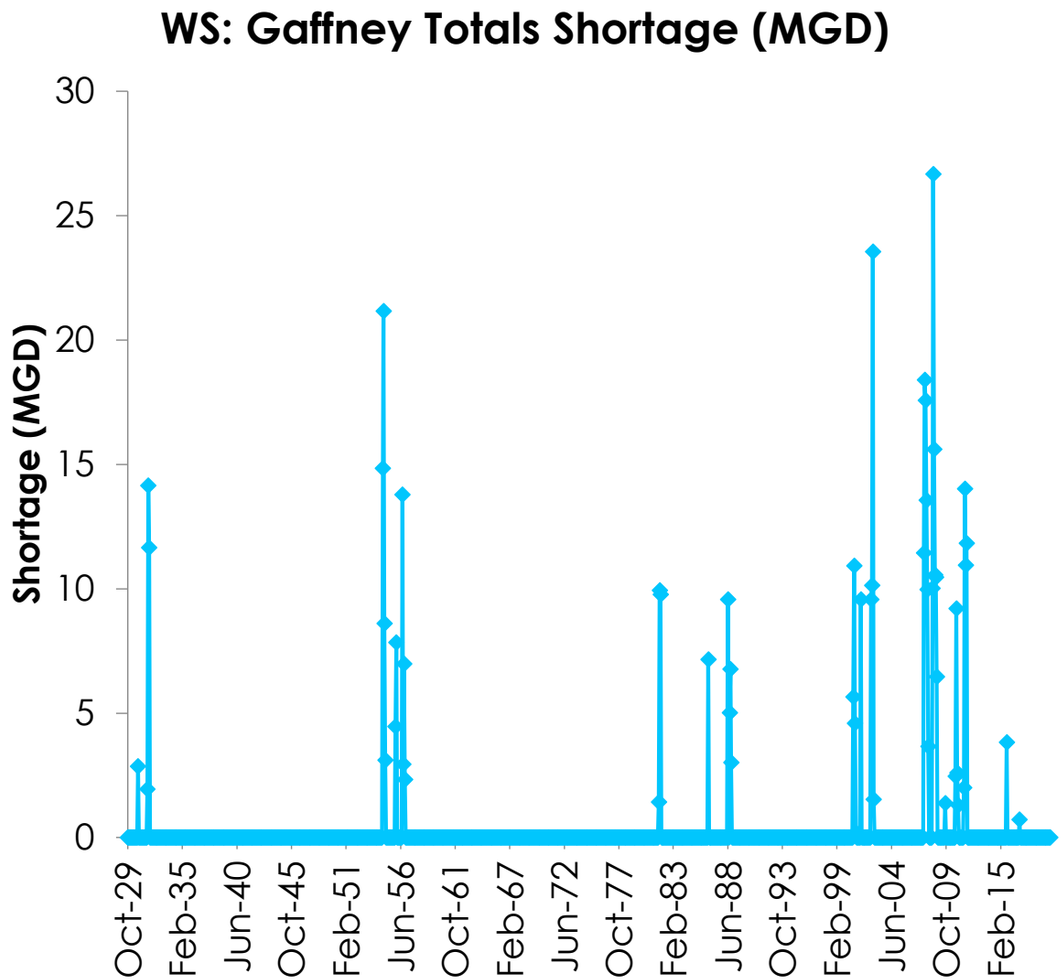


Alternatives Evaluated

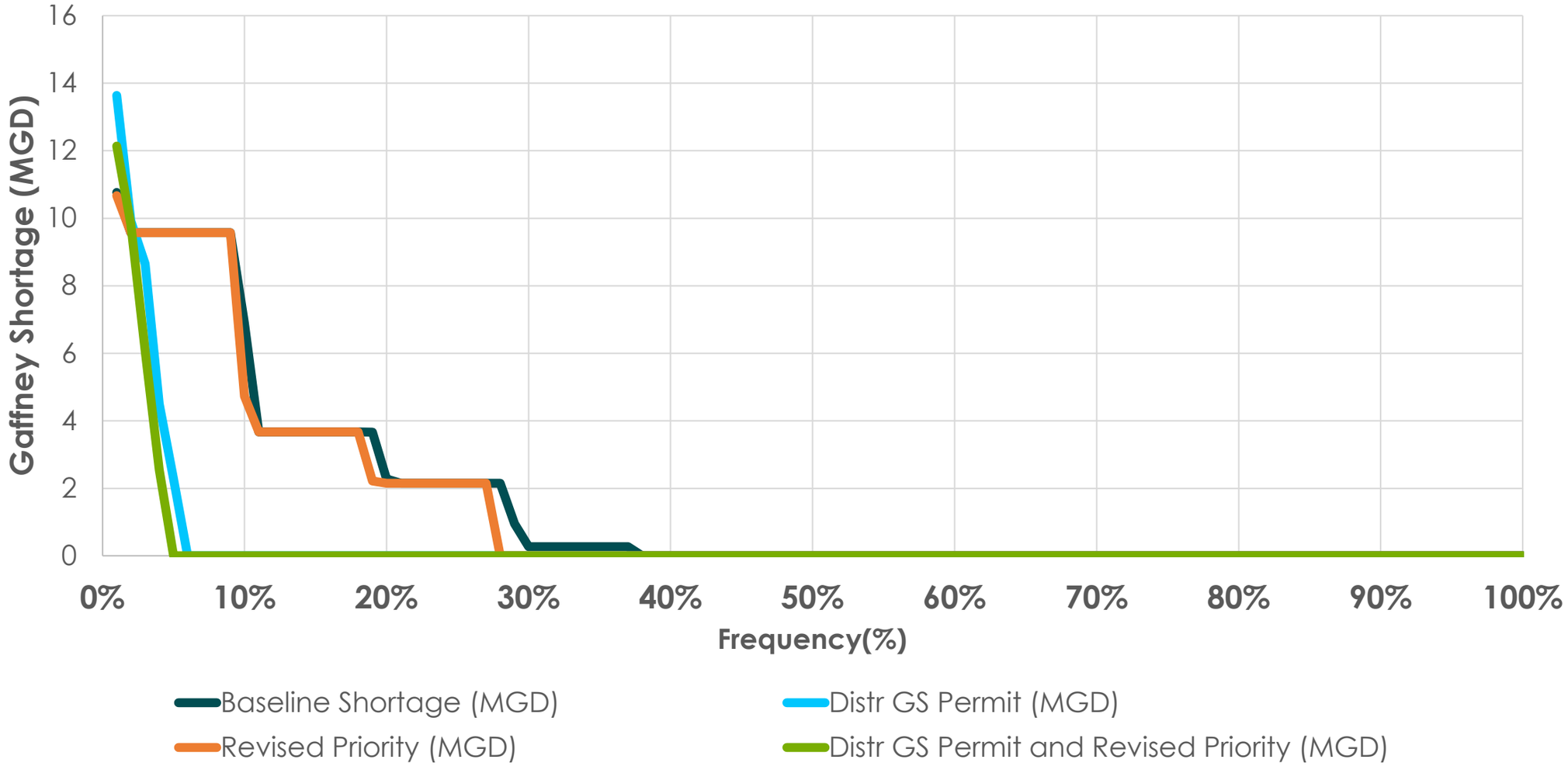
- Optimization of existing supplies (Lake Whelchel and Gaston Shoals)
- Lake Whelchel – raise dam by 3-ft (with Optimization)
- New Broad River withdrawal below Buffalo Creek
- Lake Blalock direct withdrawal
- Off-line quarry
- New reservoir on Kings Creek
- New regional reservoir

Gaston Shoals Operations Optimization

	Original High Demand 2070	Withdrawal Optimization	Withdrawal Optimization and Revised Priority
Gaffney Average Shortage (MGD)	1.6	0.51	0.42
Gaffney Max Shortage (MGD)	26.7	26.7	26.7
Gaffney Frequency of Shortage (%)	37%	5.9%	5%



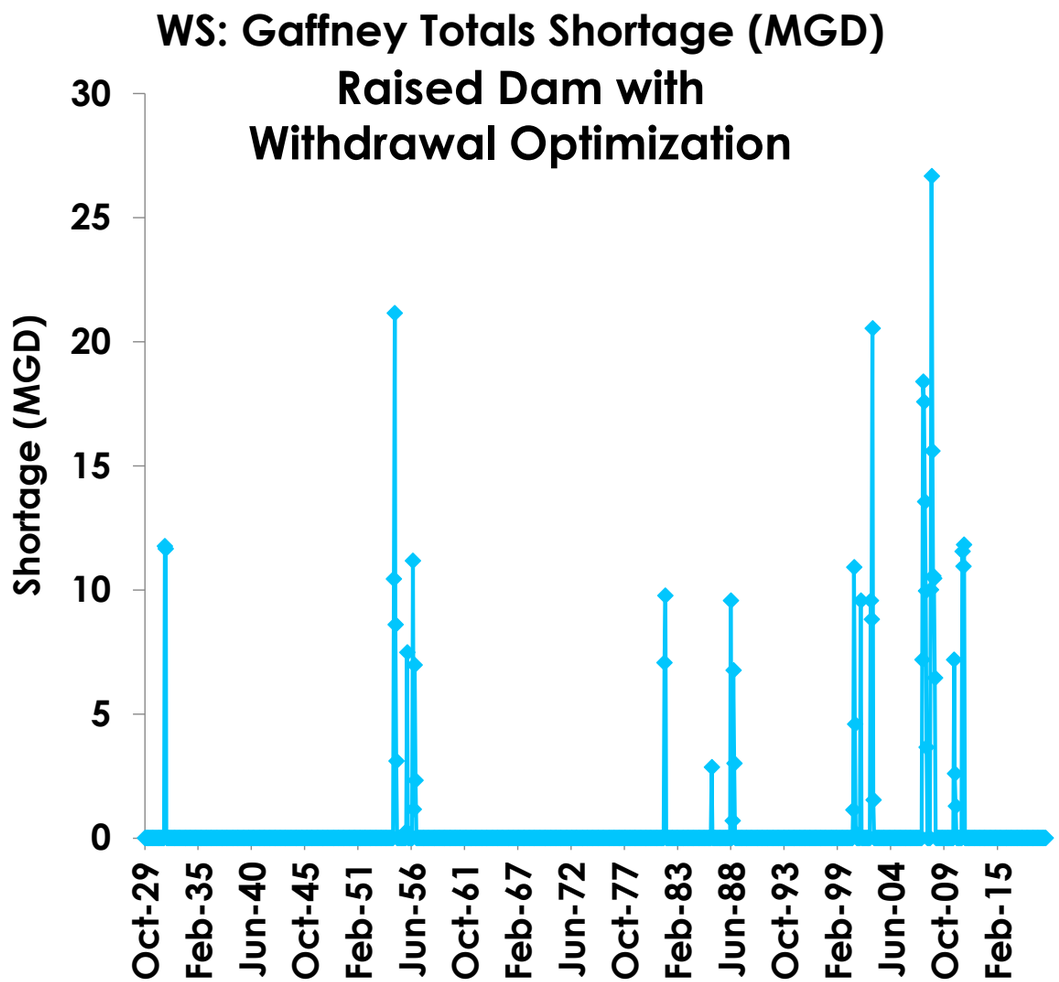
Gaston Shoals Operations Optimization



Lake Whelchel 3-ft Dam Raise

Increase from 815 MG to 963 MG

	Original High Demand 2070	Raised Dam	Withdrawal Optimization and Revised Priority	Raised Dam with Withdrawal Optimization
Gaffney Average Shortage (MGD)	1.62	1.57	0.42	0.37
Gaffney Max Shortage (MGD)	26.7	26.7	26.7	26.7
Gaffney Frequency of Shortage (%)	37.4%	36.5%	5%	4%

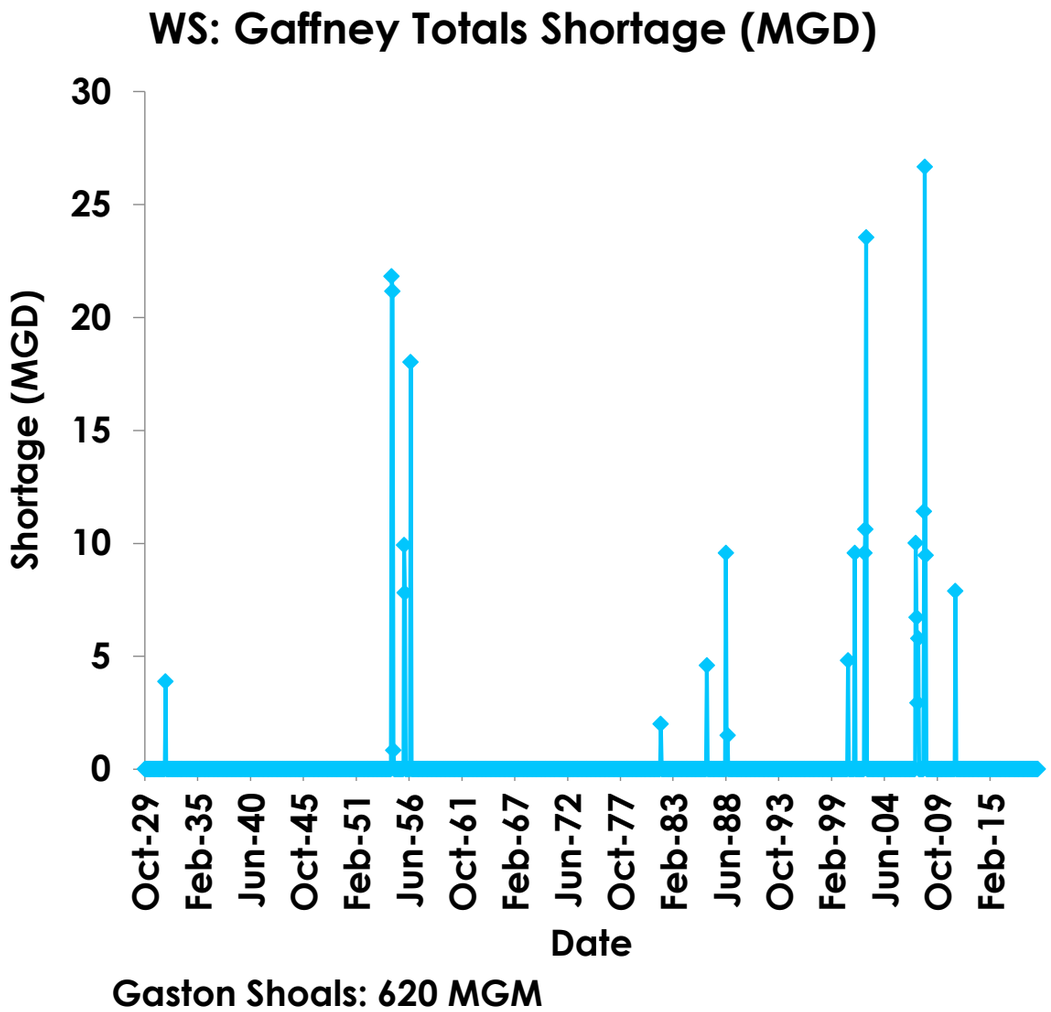


Relaxed Gaston Shoals Permit Limits

Gaston Shoals:

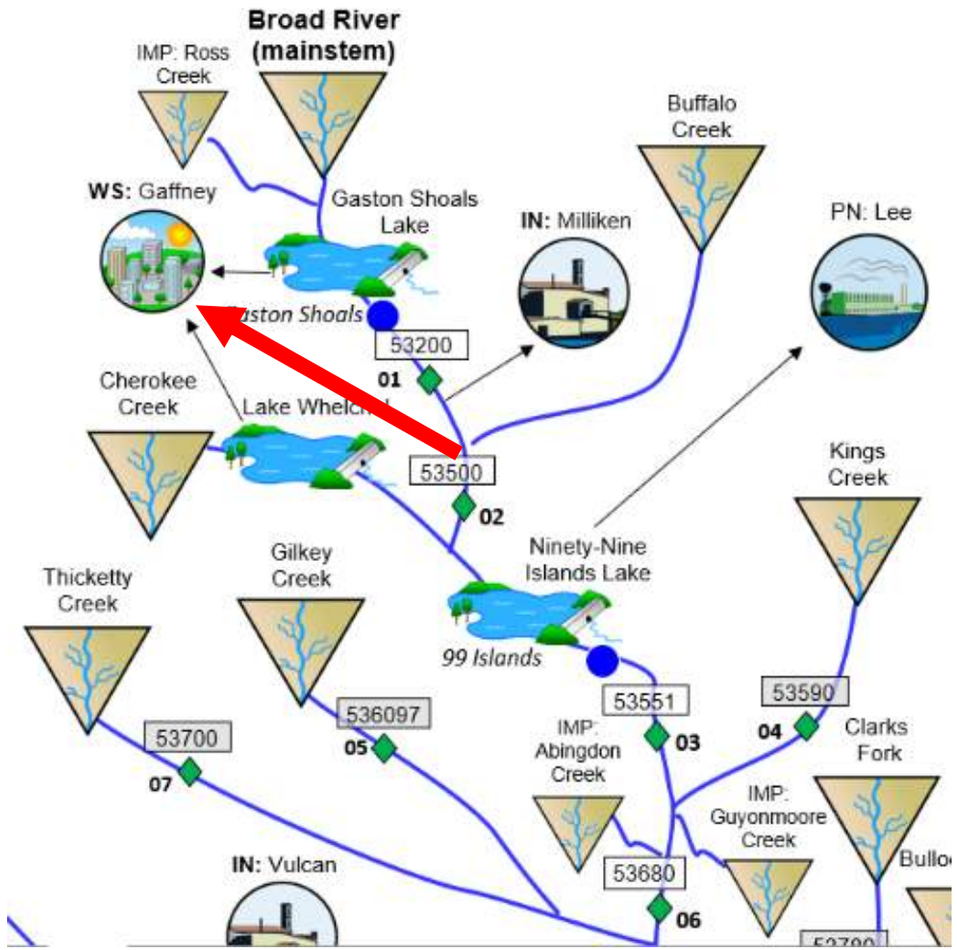
- 620 MGM DHEC permit
- 6 MGD annual average from Gaston Shoals (FERC limit)

	Original High Demand 2070	Applying DHEC 620 MGM Permit	No Gaston Shoals Withdrawal Limit
Gaffney Average Shortage (MGD)	1.6	0.22	0.18
Gaffney Max Shortage (MGD)	26.7	26.7	26.7
Gaffney Frequency of Shortage (%)	37%	2.2%	1.4%

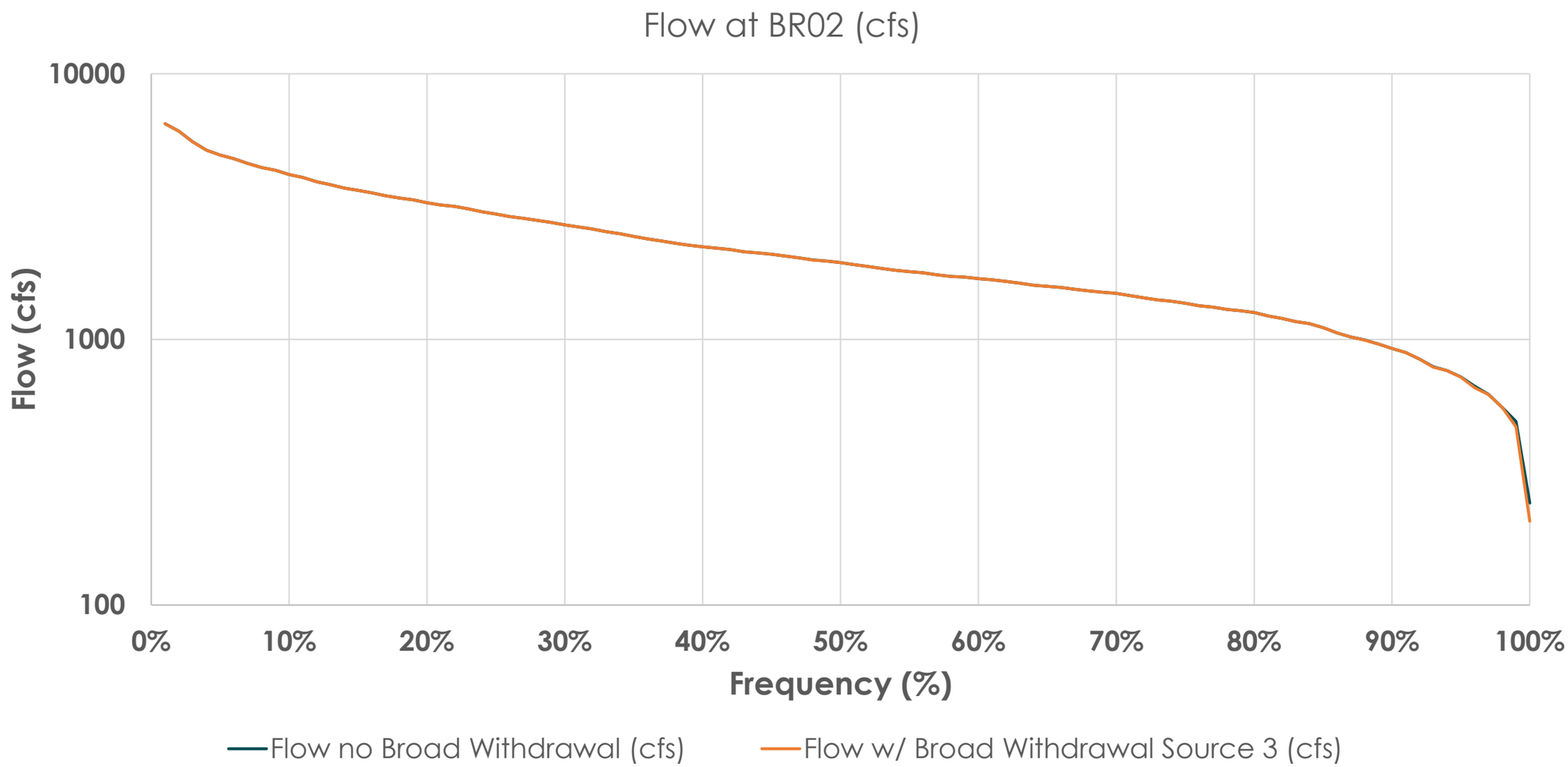


New Broad River Withdrawal

	Original HD 2070	Withdrawal Optimization and New Broad River (3rd Source)
Gaffney Average Shortage (MGD)	1.6	0
Gaffney Max Shortage (MGD)	26.7	0
Gaffney Frequency of Shortage (%)	37%	0%
Max Broad Withdrawal (MGD)	0	14.1
Average Broad Withdrawal (MGD)	0	0.4
Min Gaged Flow BR02 (MGD)	157	134

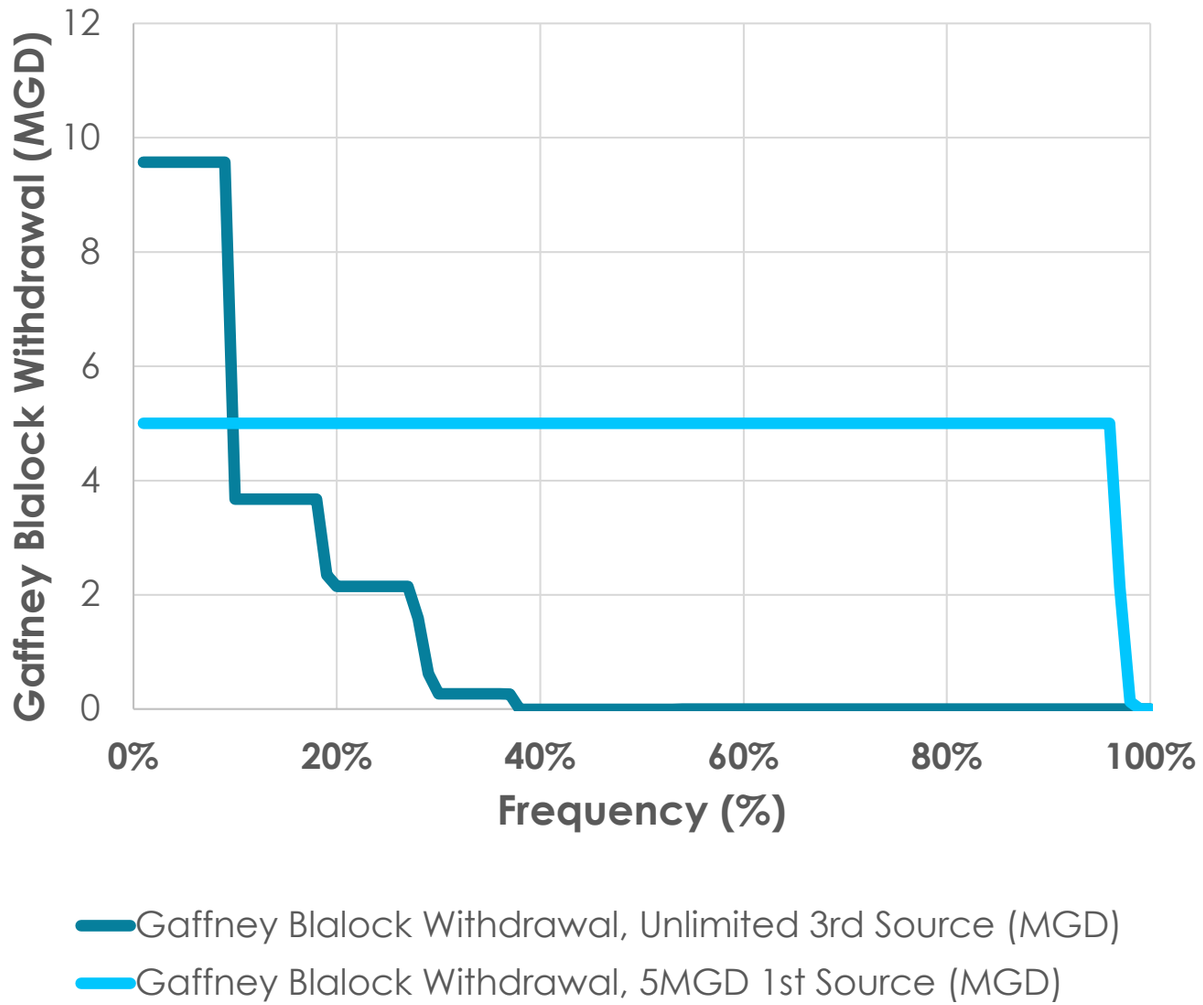


New Broad River Withdrawal



Lake Blalock

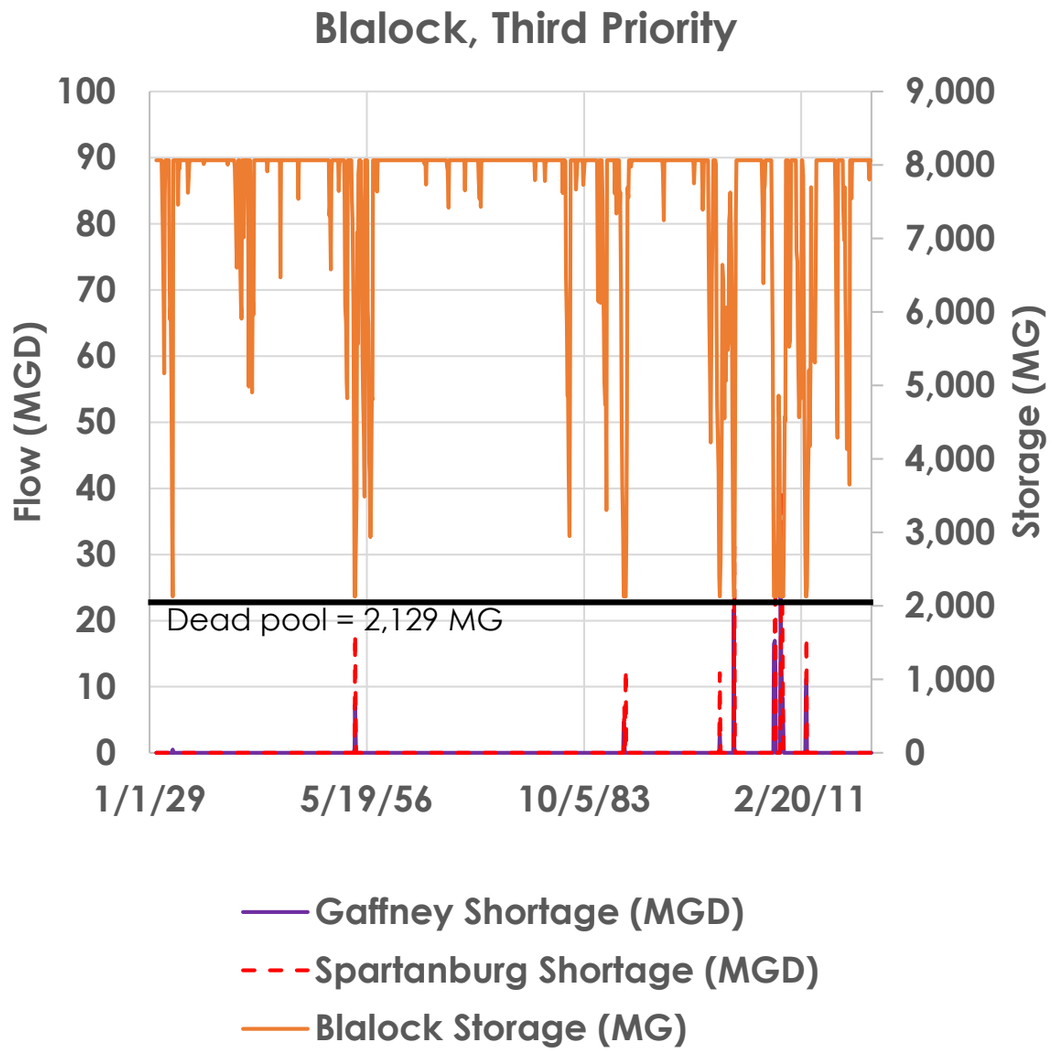
- **Scenario 1:** Gaffney's 3rd source, withdrawal as needed
- **Scenario 2:** Gaffney's 1st source, 5 MGD withdrawal capacity



Lake Blalock, 3rd Source

	Original 2070 High Demand	Lake Blalock, 3rd Source
Gaffney Average Shortage (MGD)	1.6	0.15
Gaffney Max Shortage (MGD)	26.7	24.3
Gaffney Frequency of Shortage (%)	37%	1.7%

Gaffney shortages coincident with Spartanburg shortages

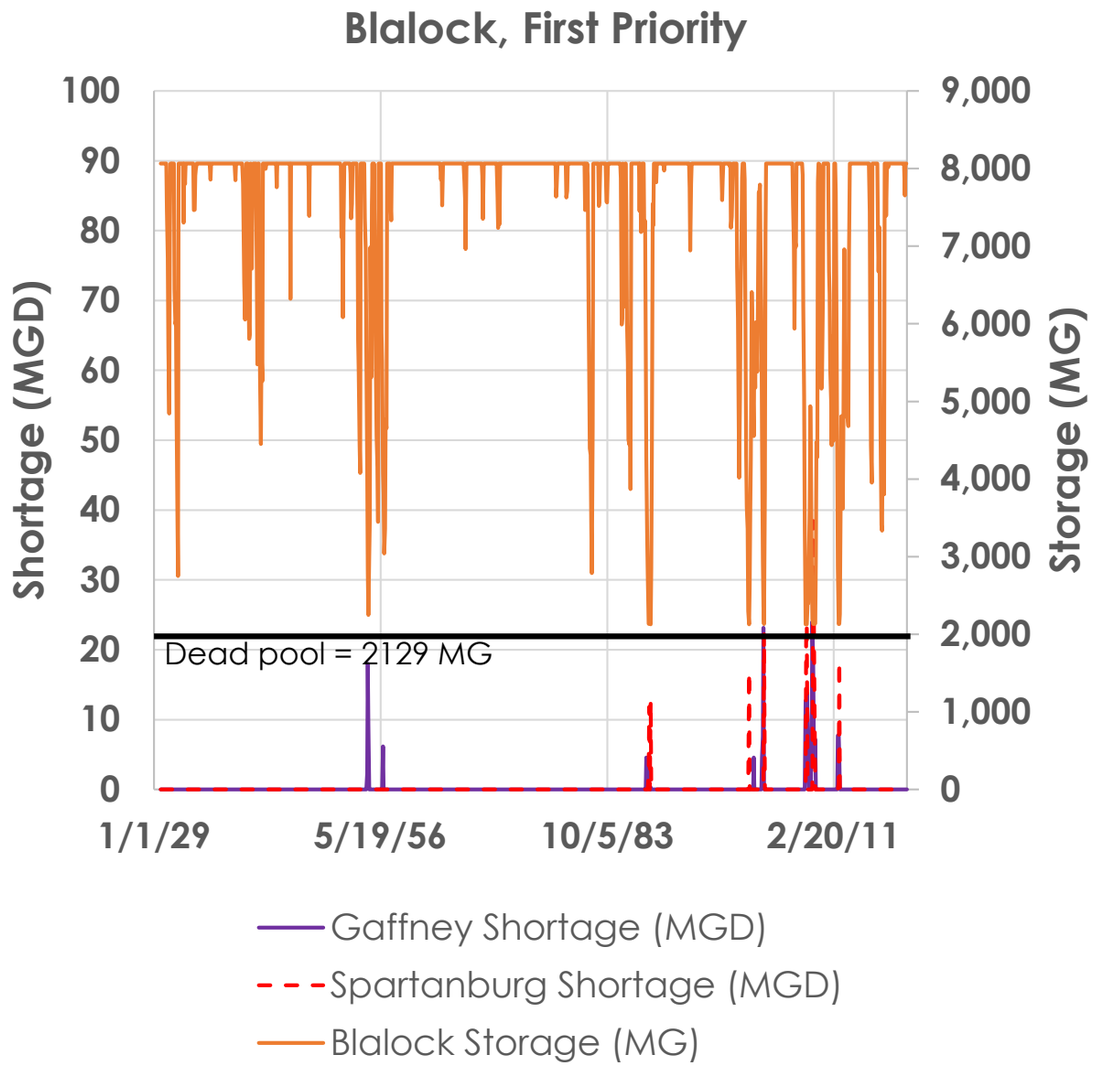


Lake Blalock, 1st Source

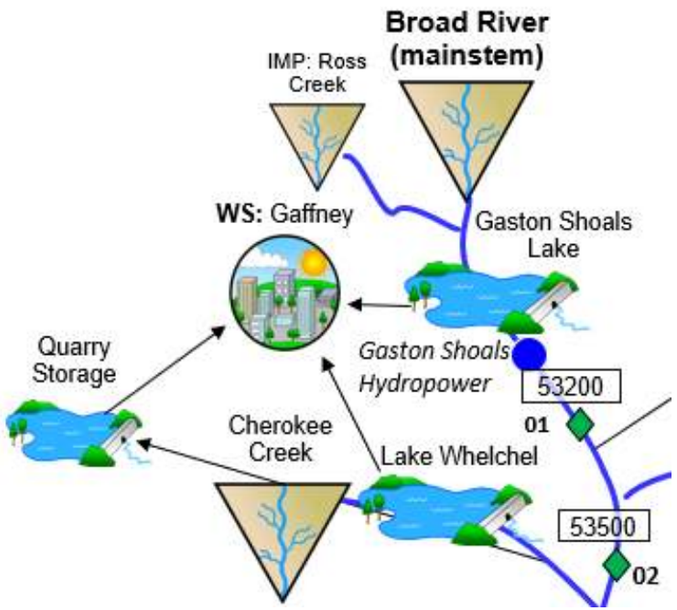
	Original 2070 High Demand	Lake Blalock, 1st Source
Gaffney Average Shortage (MGD)	1.6	0.21
Gaffney Max Shortage (MGD)	26.7	24.0
Gaffney Frequency of Shortage (%)	37%	2.5%

There are some Gaffney shortages when Spartanburg does not have shortages. Gaffney limited to 5 MGD:

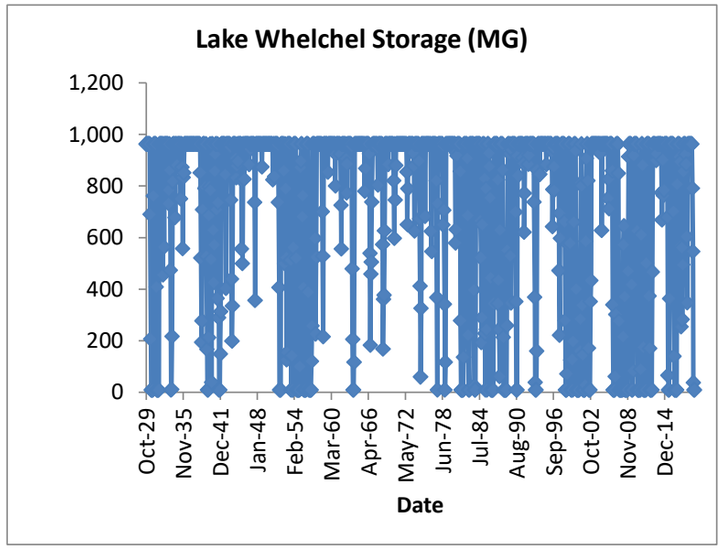
- Can't meet full demand
- Exerting less pressure on Lake Blalock than unlimited withdrawal simulation, so Spartanburg is better able to meet demands from Blalock

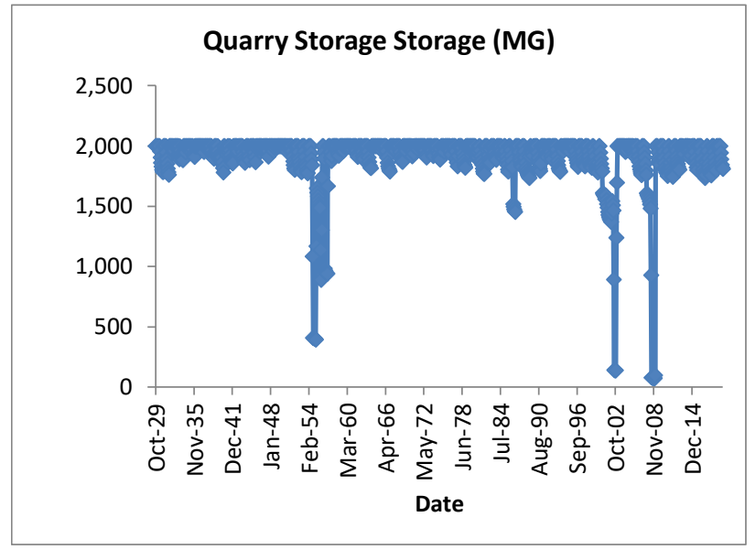


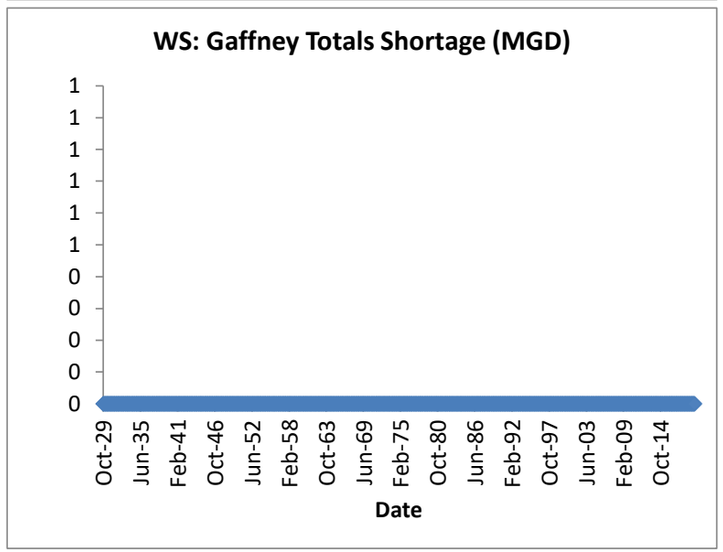
Additional Storage for Gaffney:
Conceptual Off-Line Quarry

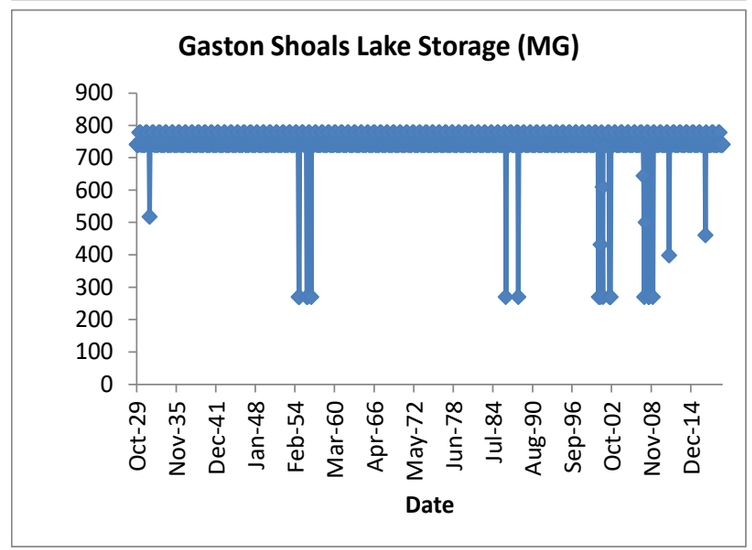


2 BG Quarry Storage downstream of Lake Whelchel (Lake Whelchel = 815 MG)



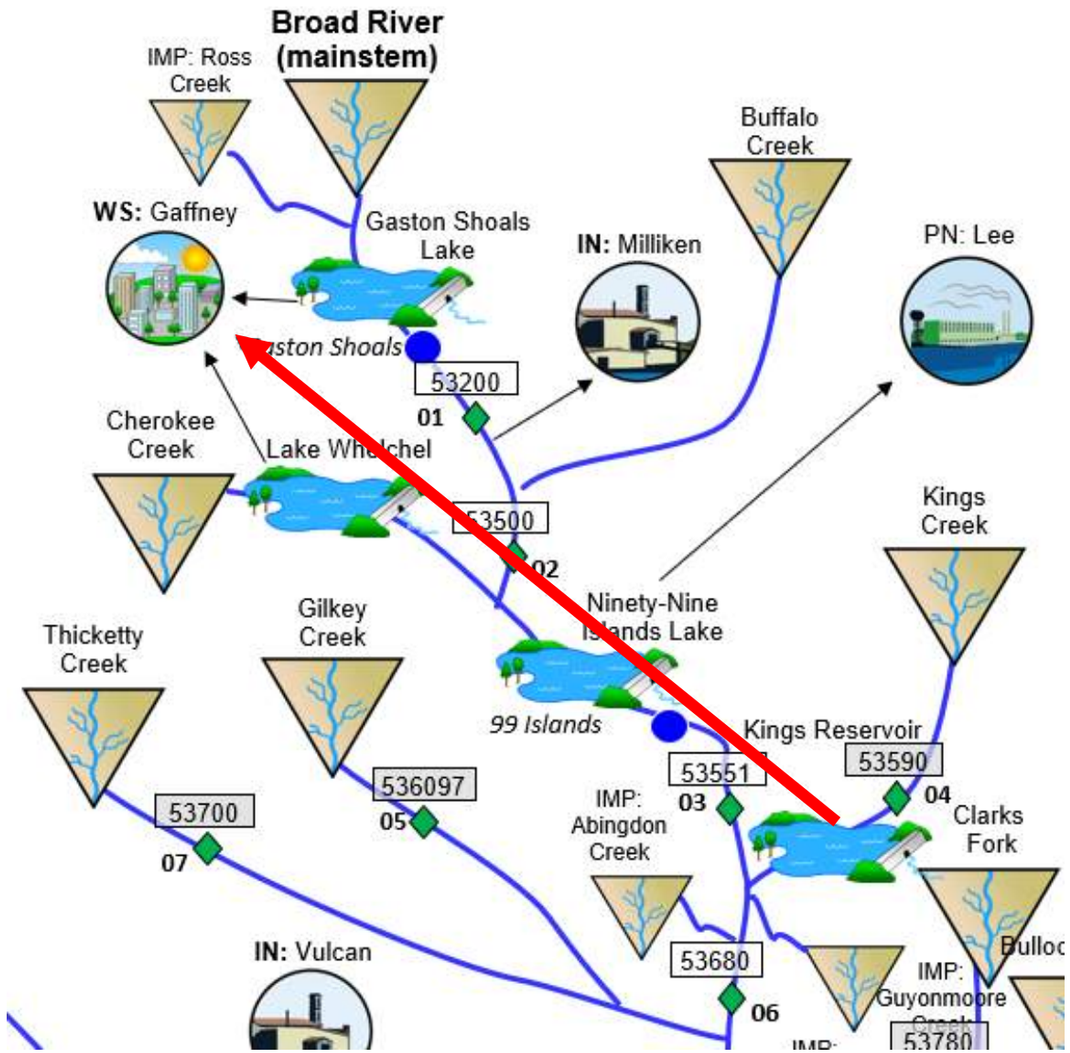






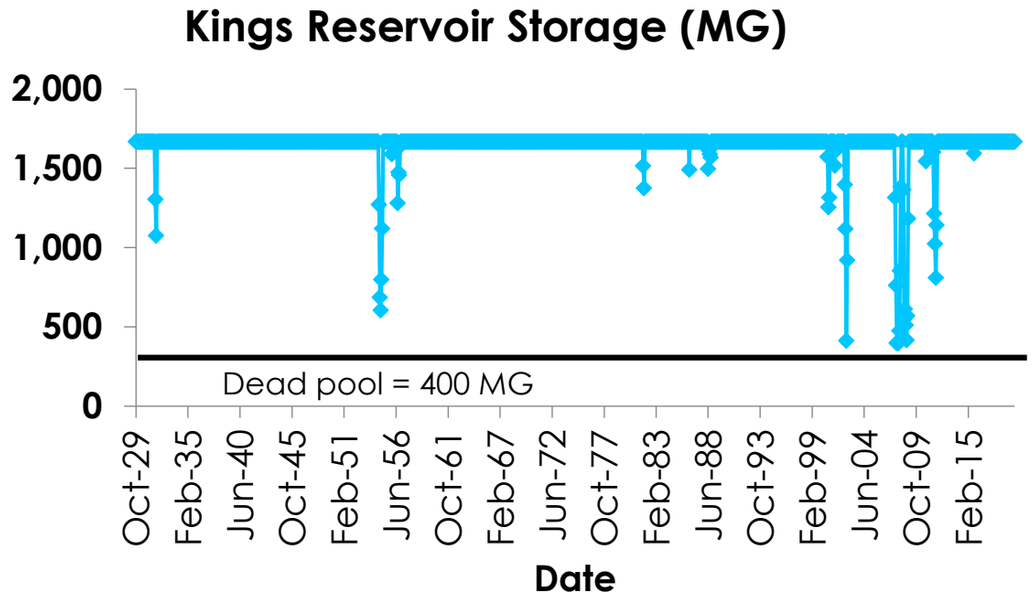
New Reservoir on Kings Creek

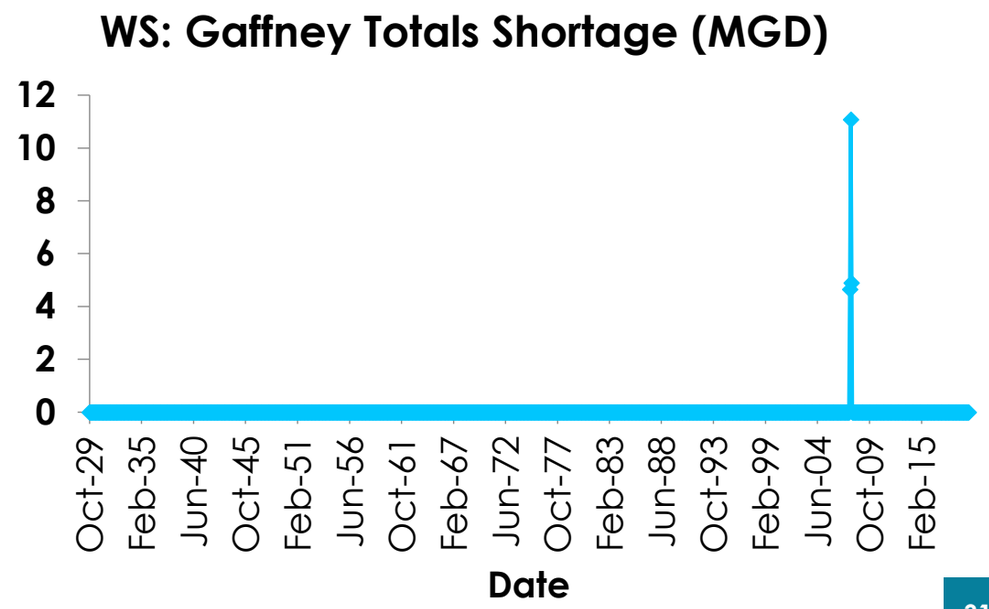
- 2002 study of alternatives sources identified reservoir site on Kings Creek
- 5,126 AF storage = 1670 MG (400 MG dead pool assumed)
- Maintain release of 95% of upstream flow



Kings Creek Reservoir

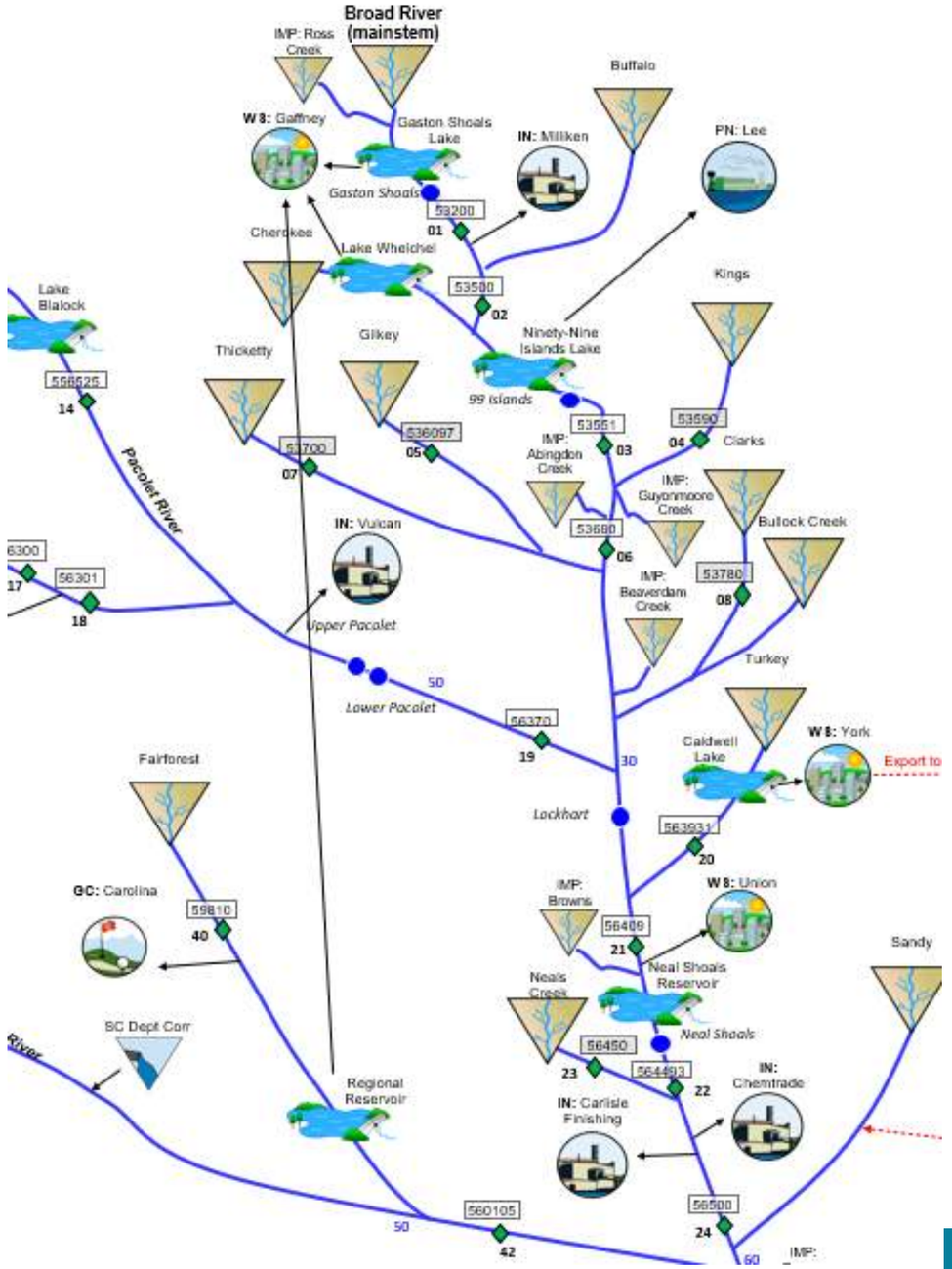
	Original 2070 High Demand	Kings Creek, 3rd Source with Withdrawal Optimization
Gaffney Average Shortage (MGD)	1.6	0.02
Gaffney Max Shortage (MGD)	26.7	11.1
Gaffney Frequency of Shortage (%)	37%	0.3%





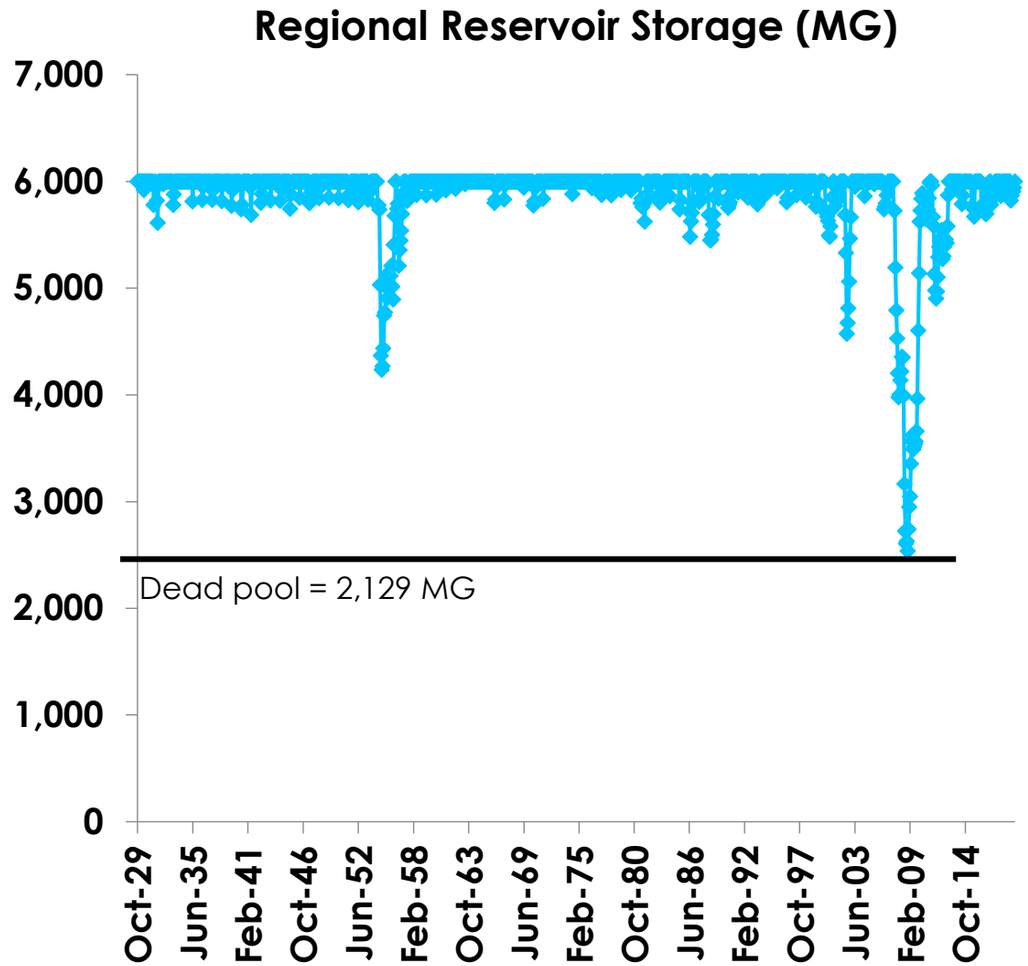
New Regional Reservoir

- **Theoretical location**
  - In middle of basin between Pacolet and Tyger rivers
  - No siting/feasibility analysis
- Assume storage/size equivalent to Lake Blalock and reduce to volume needed
- Minimum release of 95% of upstream flows

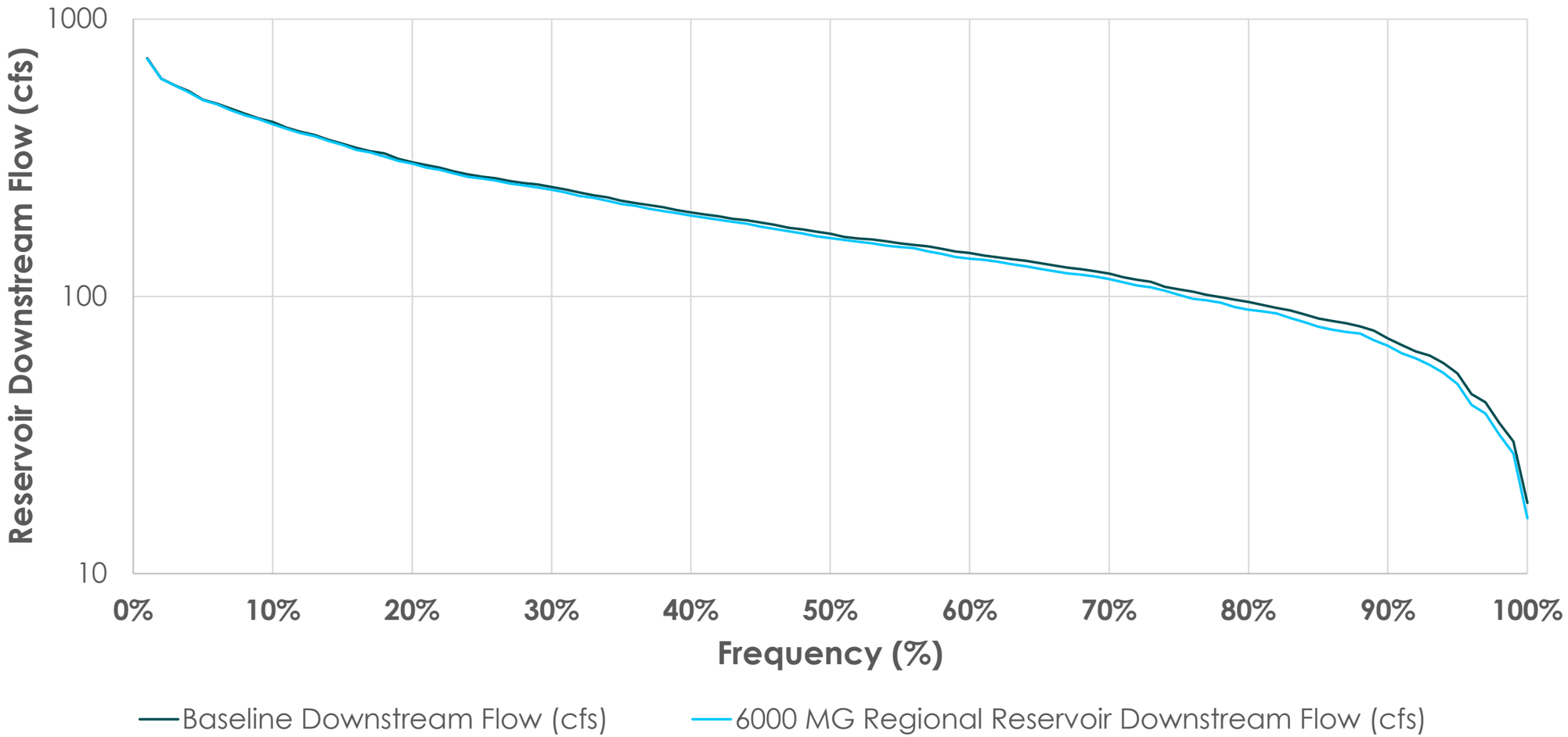


New Regional Reservoir

	Original HD 2070	Regional Reservoir, 6000 MG
Gaffney Average Shortage (MGD)	1.6	0
Gaffney Max Shortage (MGD)	26.7	0
Gaffney Frequency of Shortage (%)	37%	0%
Reservoir Max. Withdrawal (MGD)	--	27
Reservoir Average Withdrawal (MGD)	--	1.6



New Regional Reservoir Downstream Flow Duration Curve



Gaffney Alternatives Summary

Alternative	Effectiveness		
	Avg. Shortage (MGD)	Frequency of shortage (%)	Max Shortage (MGD)
Baseline	1.6	37%	26.7
Optimization of existing supplies (Lake Whelchel and Gaston Shoals):	0.42	5%	26.7
Lake Whelchel 3-ft dam raise	0.37	4%	26.7
New Broad River withdrawal	0	0%	0
Lake Blalock withdrawal	0.15	1.7%	24.3
2 BG Offline Quarry	0	0%	0
New reservoir on Kings Creek	0.02	0.3%	11.1
New regional reservoir	0	0%	0
Large Interconnection with SWS (from SWS 42" Transmission Main)	--	--	--
Smaller Interconnection with SWS (from SWS 12" Transmission Main)	--	--	--

Key:
Entirely effective
Highly effective
Somewhat effective
Not effective

Approx 12+ miles of large diameter pipeline needed

Approx 9+ miles of smaller diameter pipeline needed