Appendix X
Available Flow & Development of MFL Criteria

1.0 AVAILABLE FLOW

Section 5.0 (Evaluation of Water Resource Values) describes the process of determining hydrologic shifts from critical flow values that will not result in a greater than 15% change in the average number of days per year critical flow is exceeded for relevant Water Resource Values (WRVs). **Table 1** shows the summary of the assessed WRVs and associated critical flows and hydrologic shifts.

Table 1 - Summary of assessed WRVs and associated critical flows, percent reductions, and hydrologic shifts

	Ellaville Gage			Branford Gage		
Metric	**Critical Flow (cfs)**	**Percent Reduction from RTF Flow to Critical Flow**	**Hydrologic Shift (cfs)**	**Critical Flow (cfs)**	**Percent Reduction from RTF Flow to Critical Flow**	**Hydrologic Shift (cfs)**
General Fish Passage	1,045	43	795	2,042	30	856
Gulf Sturgeon Passage*	1,998	15	**346**	3,044	12	**400**
Recreational Boating	1,908	22	549	1,778	35	960
In-stream Habitat: Deep/Slow Guild	3,822[1]	16	600	--	--	--
In-stream Habitat: Gulf Sturgeon Adult	--	--	--	4,993[2]	19	944
Riparian Bank Habitat/Open Water	1,916	22	545	5,485	13	846
Fish Passage in/out Allen Mill Pond Spring	3,079	18	667	--	--	--
Fish Passage in/out Peacock Springs	7,453	12	1,021	--	--	--
Bankfull	8,282	13	1,212	10,553	10	1,118
Deep Swamp	9,028	11	1,143	12,259	7	984
Bottomland Swamp	17,776	5	983	17,149	6	1,179
Alluvial Ridge Crest	34,623	6	2,021	24,996	4	1,030

*Fall migration values used for Gulf sturgeon passage, as these were more protective than spring migration values
Blue shading indicates limiting WRV

[1] This represents the Median RTF flow. SEFA modeling applies to flows ranging from 1,324 to 16,370 cfs.
[2] This represents the Median RTF flow. SEFA modeling applies to flows ranging from 1,730 to 22,600 cfs

The amount of available flow or hydrologic shift (derived by subtracting critical flow from RTF flow) was plotted against the corresponding critical flow values to assess the availability of water across the RTF flow range, and the resulting available flow graphs for Ellaville and Branford were subsequently used to determine the potential allowable withdrawal schedule and determine comprehensive MFL criteria (**Figure 1** and **Figure 2**).

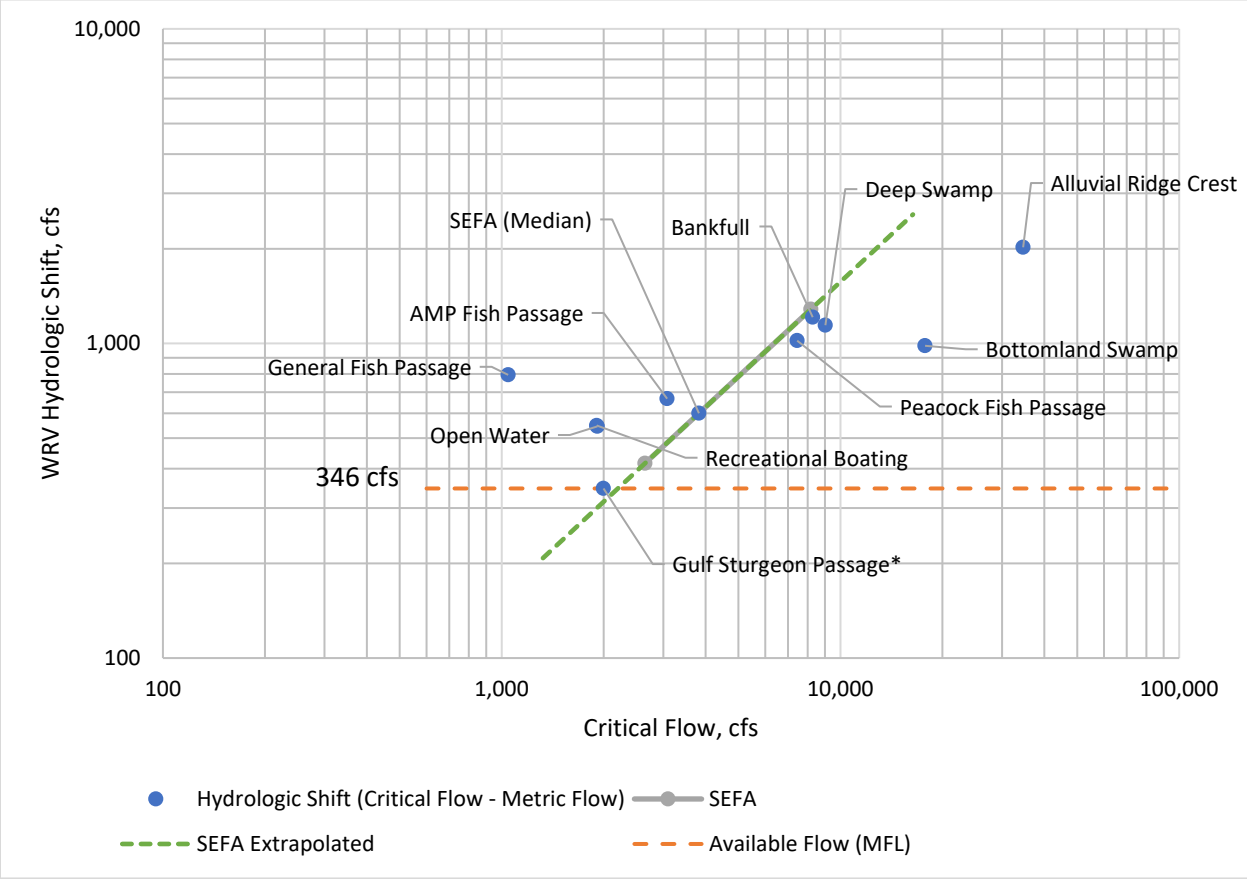

Figure 6-1. Available flow versus critical flow for WRVs and MFL conditions at Ellaville

Asterisk denotes most limiting WRV

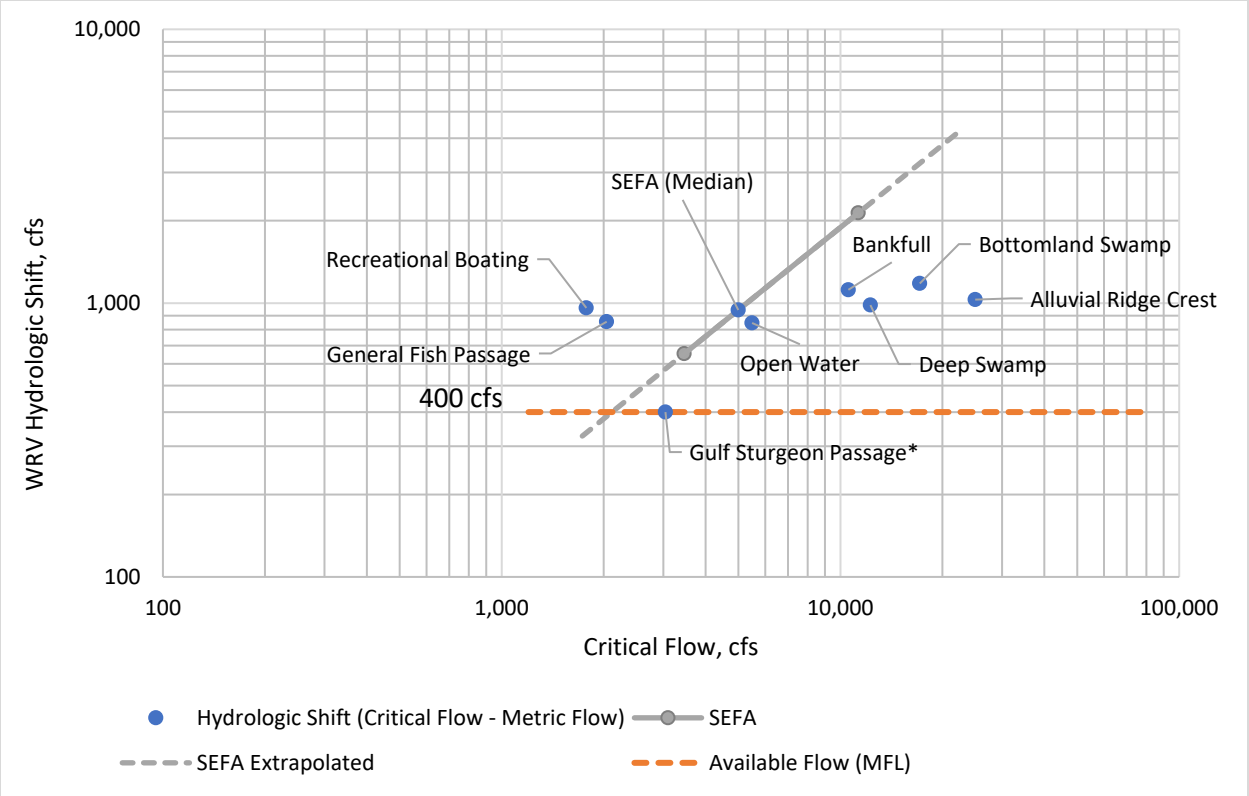

Figure 6-2. Available flow versus critical flow for WRVs and MFL conditions at Branford

Asterisk denotes most limiting WRV

2.0 DEVELOPMENT OF MFL CRITERIA

It was determined that a single value flow reduction approach would be taken, using the most restrictive or limiting critical flows. In the case of both Ellaville and Branford, this corresponds with Gulf sturgeon fall passage and results in a reduction of 346 cfs across the flow duration curve for Ellaville and 400 cfs for Branford (**Figure 3** and **Figure 4**). The underlying premise of applying a single-value flow reduction below median flows is the assumption that regional withdrawals are from groundwater pumping. If surface water diversions are proposed in the future, then larger volumes of water would be available without causing significant harm when flows are above median conditions.

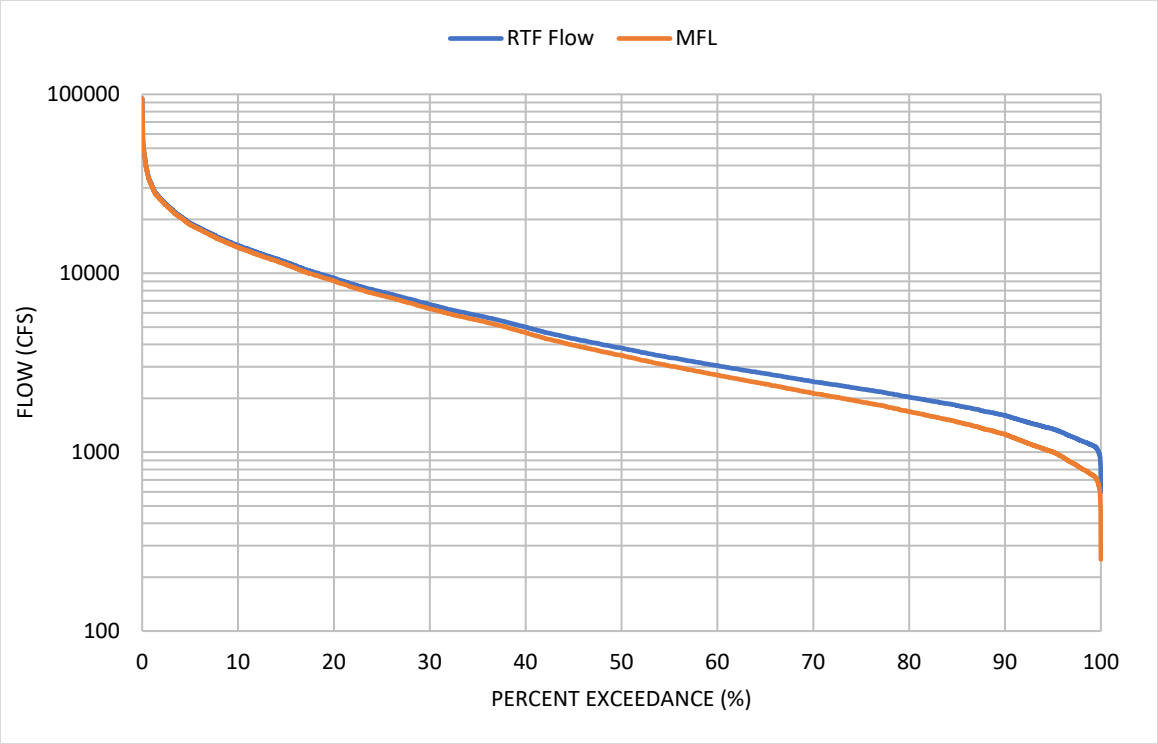

Figure 3. Ellaville RTF and proposed MFL flow duration curves

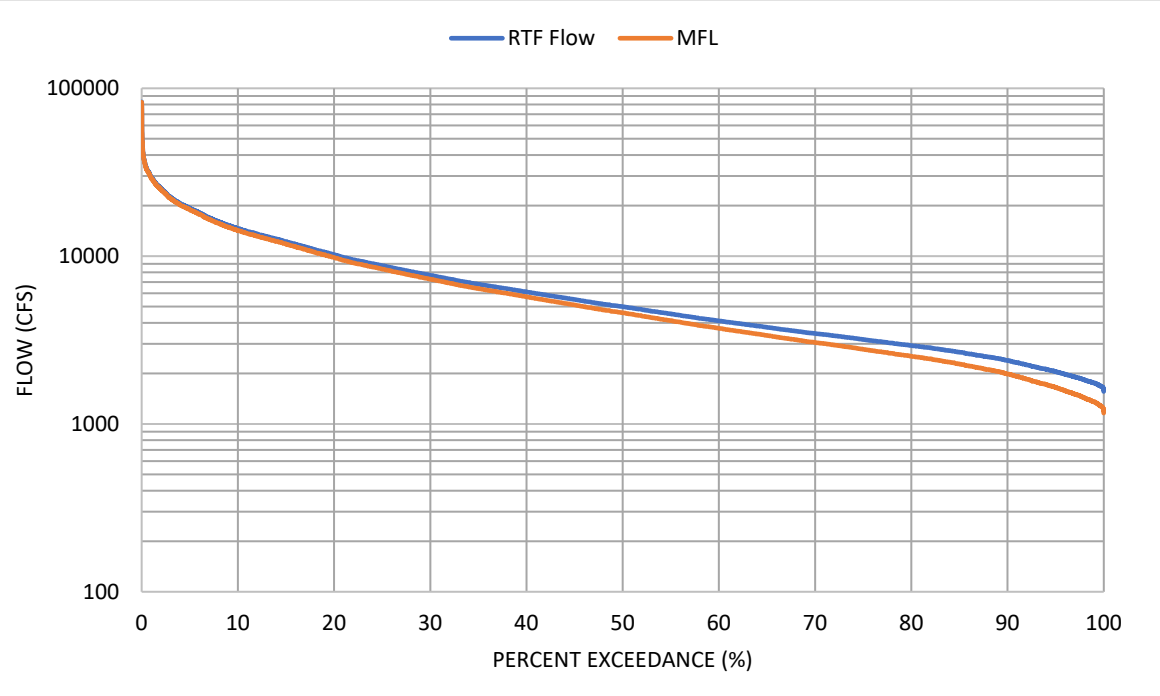

Figure 4. Branford RTF and proposed MFL flow duration curves

Based on the established MFL criteria, the maximum allowable percent reductions in flow and corresponding MFL flows for the assessed WRVs were recomputed and the associated critical flow day plots were updated. **Table 2** shows the updated available flow and percentage values under MFL conditions and **Figures 5** through **20** show the updated critical flow day plots.

Table 2 - WRVs and associated critical flows, percent reductions, and Available flows under MFL Conditions

	Ellaville Gage			Branford Gage		
Metric	**Critical Flow (cfs)**	**Updated Percent Reduction under MFL**	**Resulting Available Flow (cfs)**	**Critical Flow (cfs)**	**Updated Percent Reduction under MFL**	**Resulting Available Flow (cfs)**
General Fish Passage	1,045	25	346	2,042	16	400
Gulf Sturgeon Passage*	1,998	15	346	3,044	12	400
Recreational Boating	1,908	15	346	1,778	18	400
In-stream Habitat: Deep/Slow Guild	3,822[3]	8	346	--	--	--
In-stream Habitat: Gulf Sturgeon Adult	--	--	--	4,993[4]	7	400
Riparian Bank Habitat/Open Water	1,916	15	346	5,485	7	400
Fish Passage in/out Allen Mill Pond Spring	3,079	10	346	--	--	--
Fish Passage in/out Peacock Springs	7,453	4	346	--	--	--
Bankfull	8,282	4	346	10,553	4	400
Deep Swamp	9,028	4	346	12,259	3	400
Bottomland Swamp	17,776	2	346	17,149	2	400
Alluvial Ridge Crest	34,623	1	346	24,996	2	400

*Fall migration values used for Gulf sturgeon passage, as these were more protective than spring migration values

[3] This represents the Median RTF flow. SEFA modeling applies to flows ranging from 1,324 to 16,370 cfs.
[4] This represents the Median RTF flow. SEFA modeling applies to flows ranging from 1,730 to 22,600 cfs

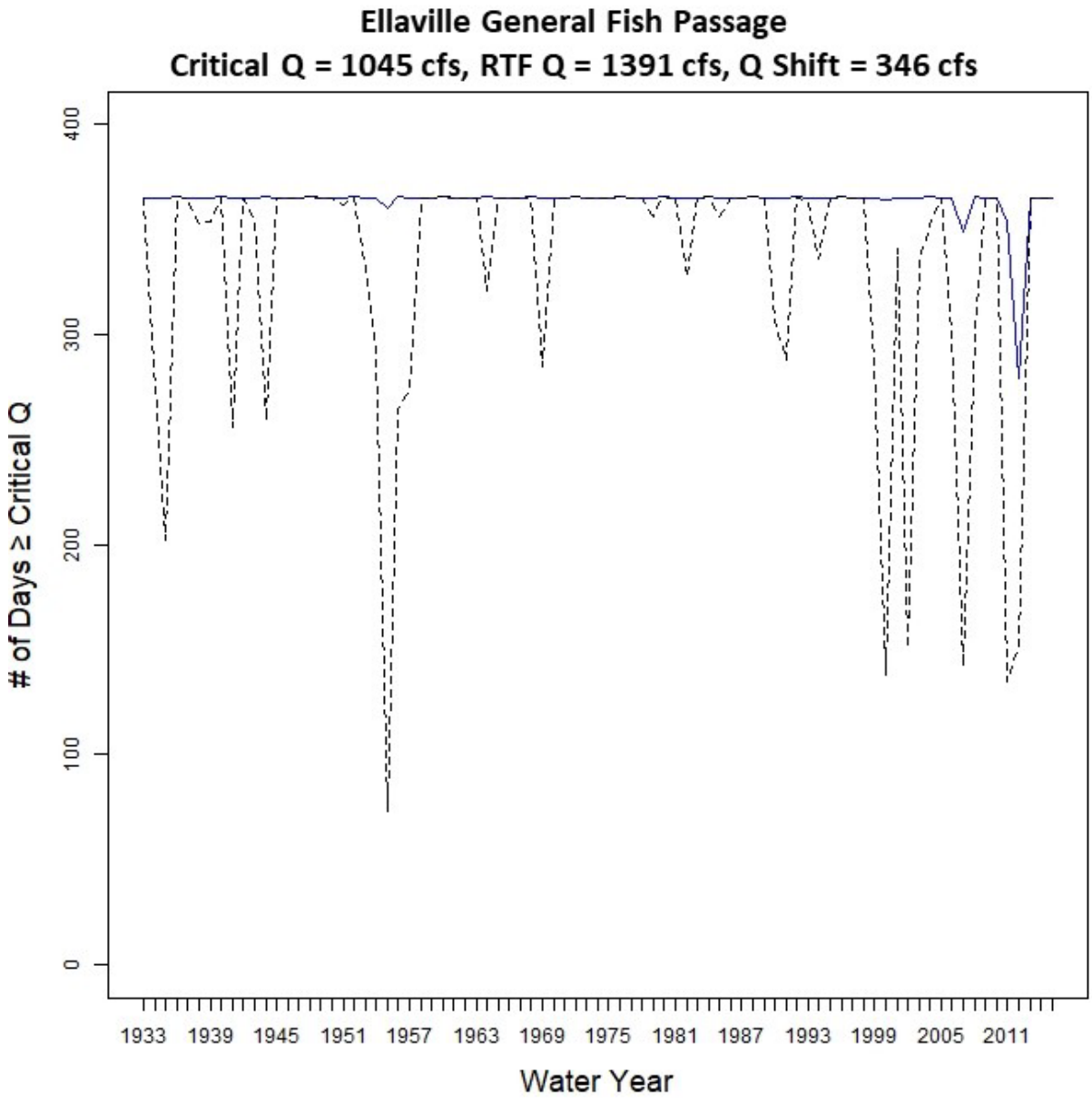

Figure 5 - Updated Ellaville General Fish Passage results:
Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

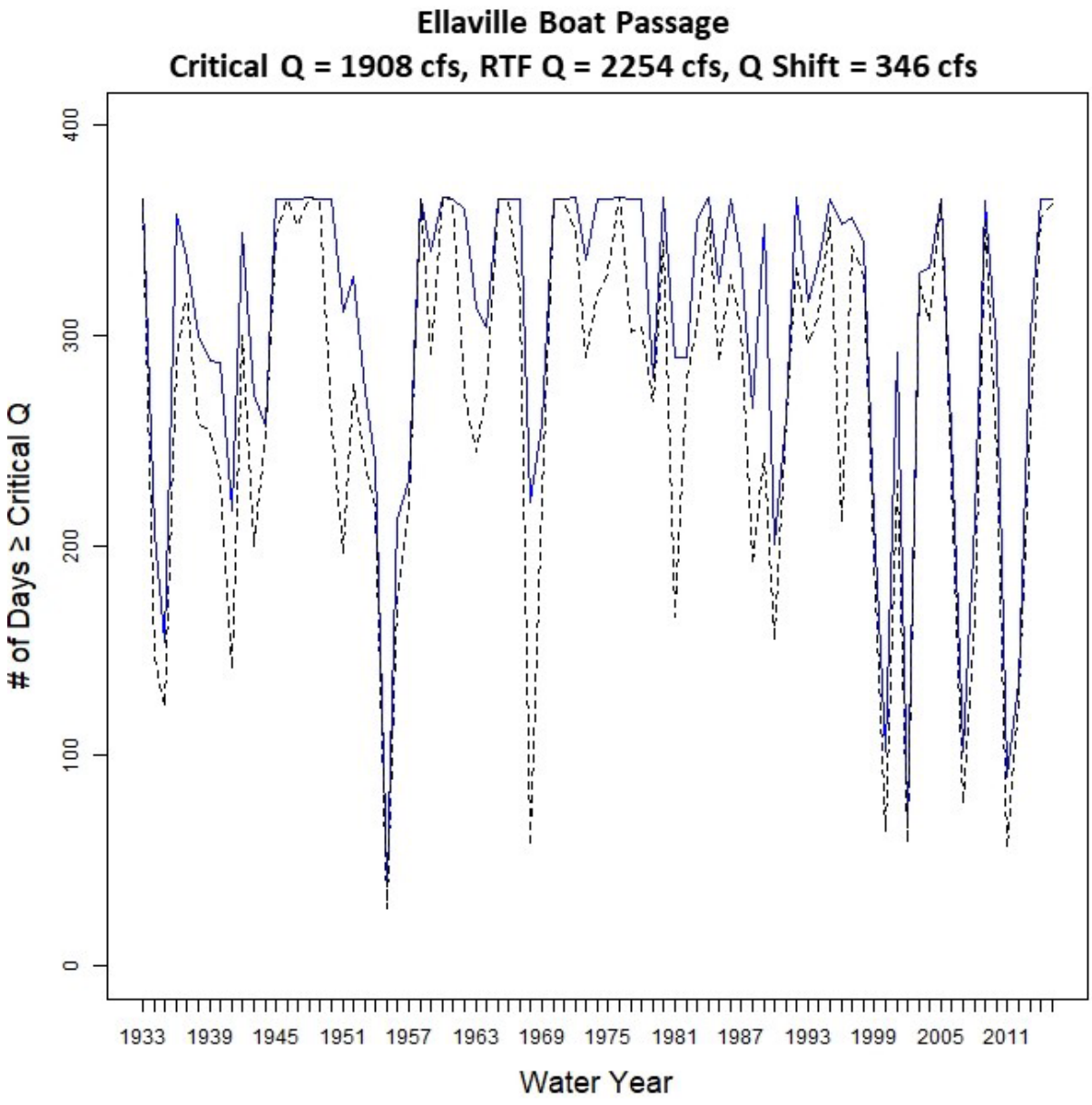

Figure 6 - Updated Ellaville Boat Passage results:
Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

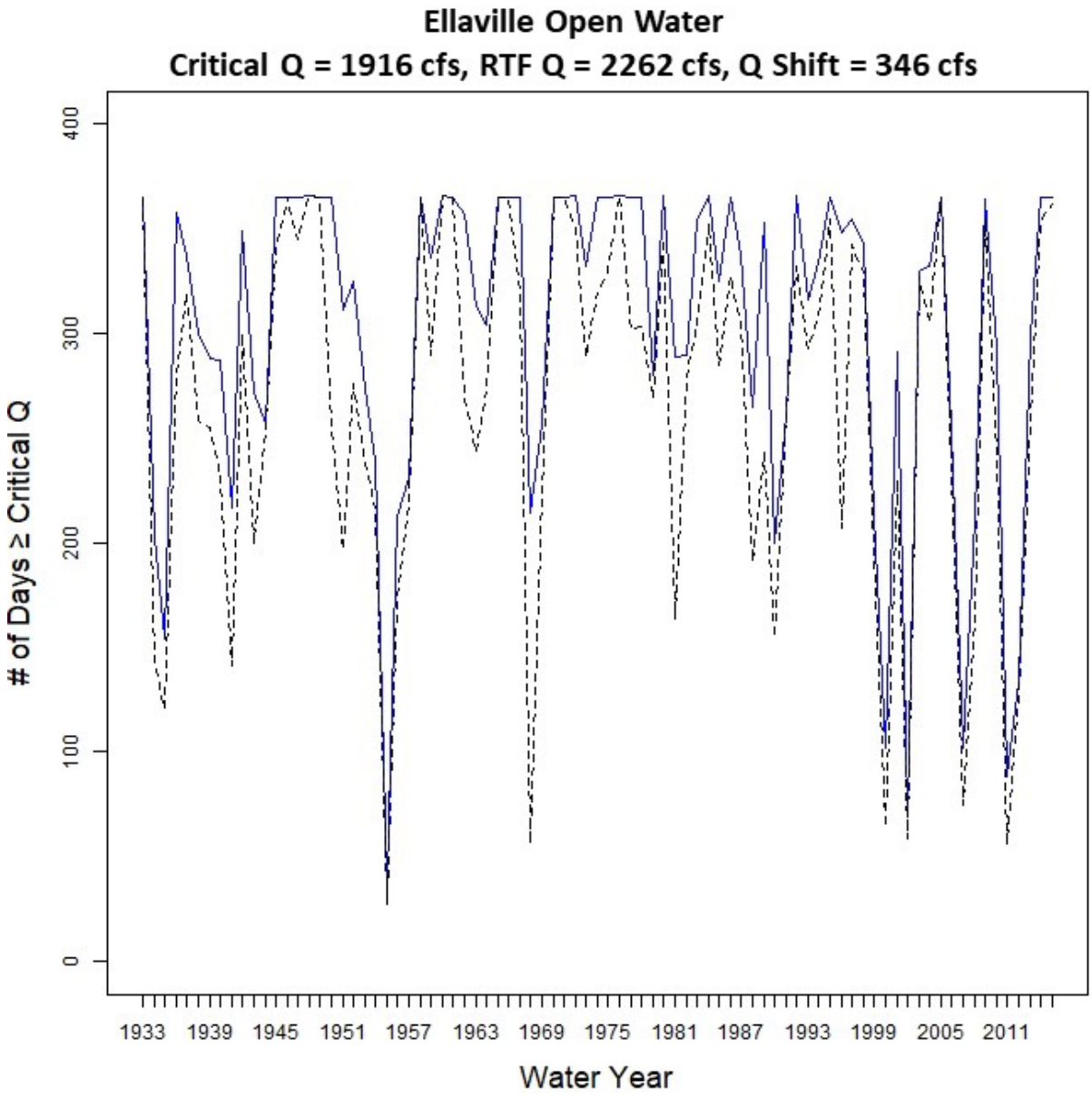

Figure 7 - Updated Ellaville Open Water results:

Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

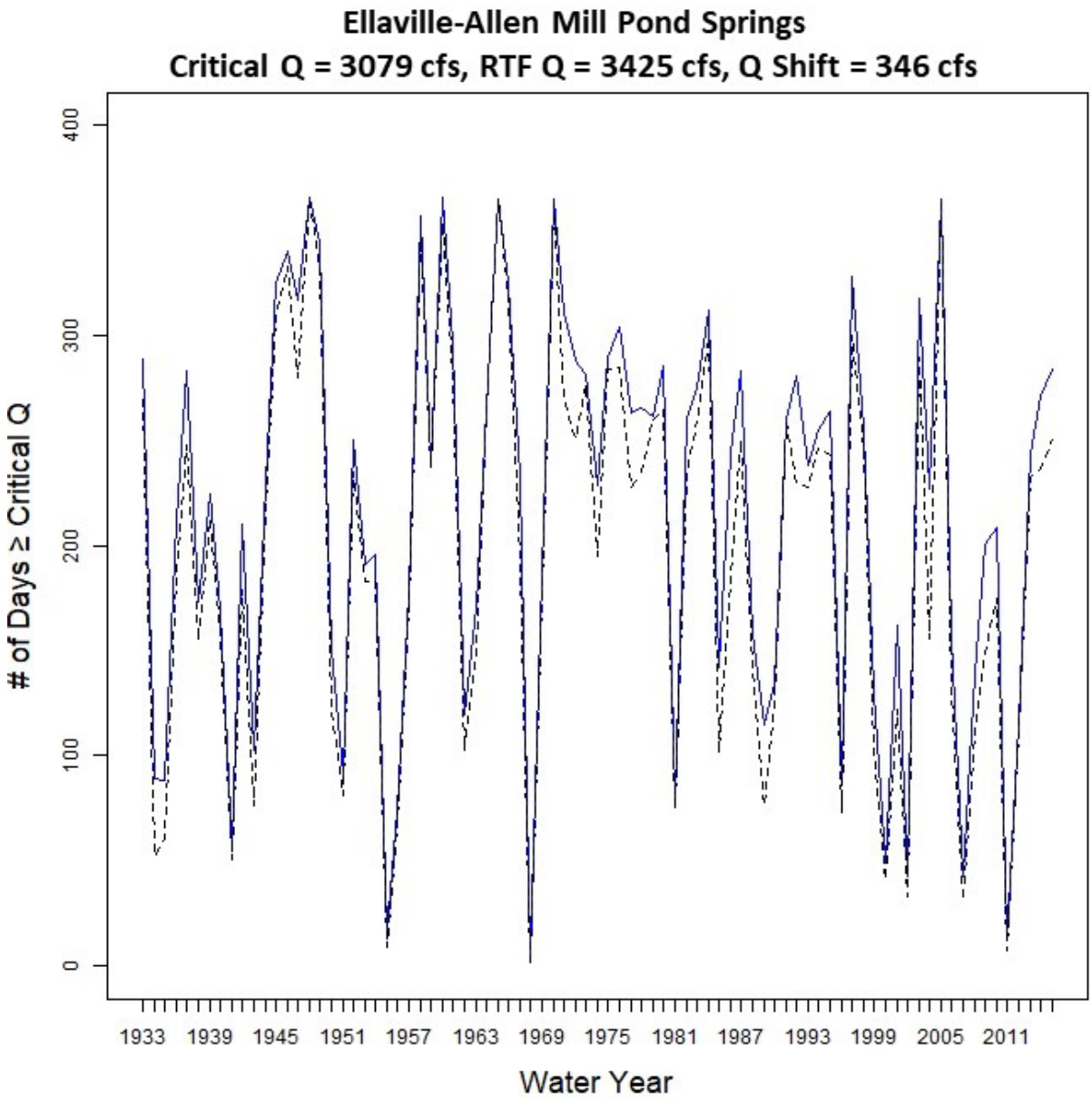

Figure 8 - Updated Ellaville-Allen Mill Pond Springs results: Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

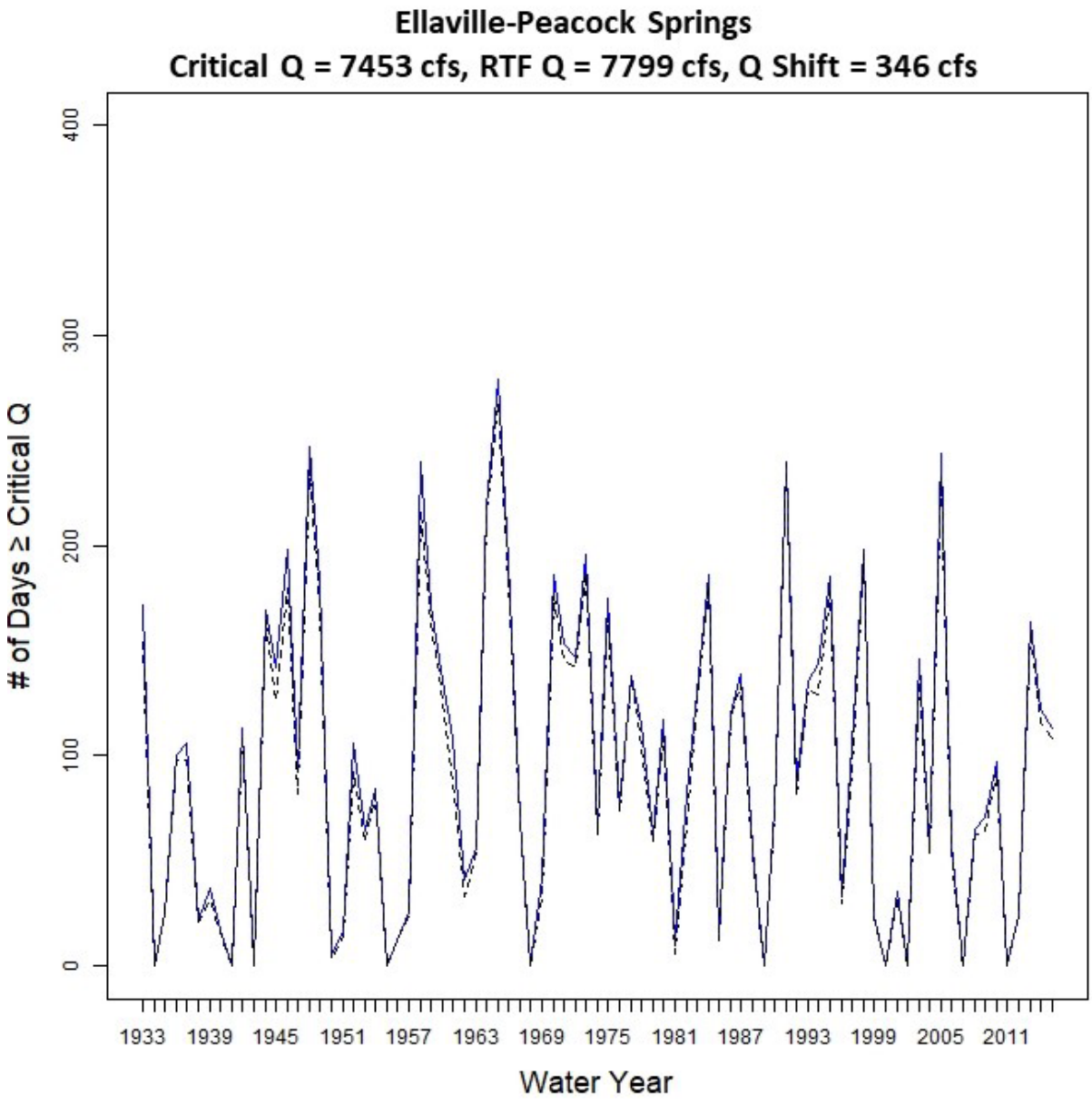

Figure 9 - Updated Ellaville-Peacock Springs results:
Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

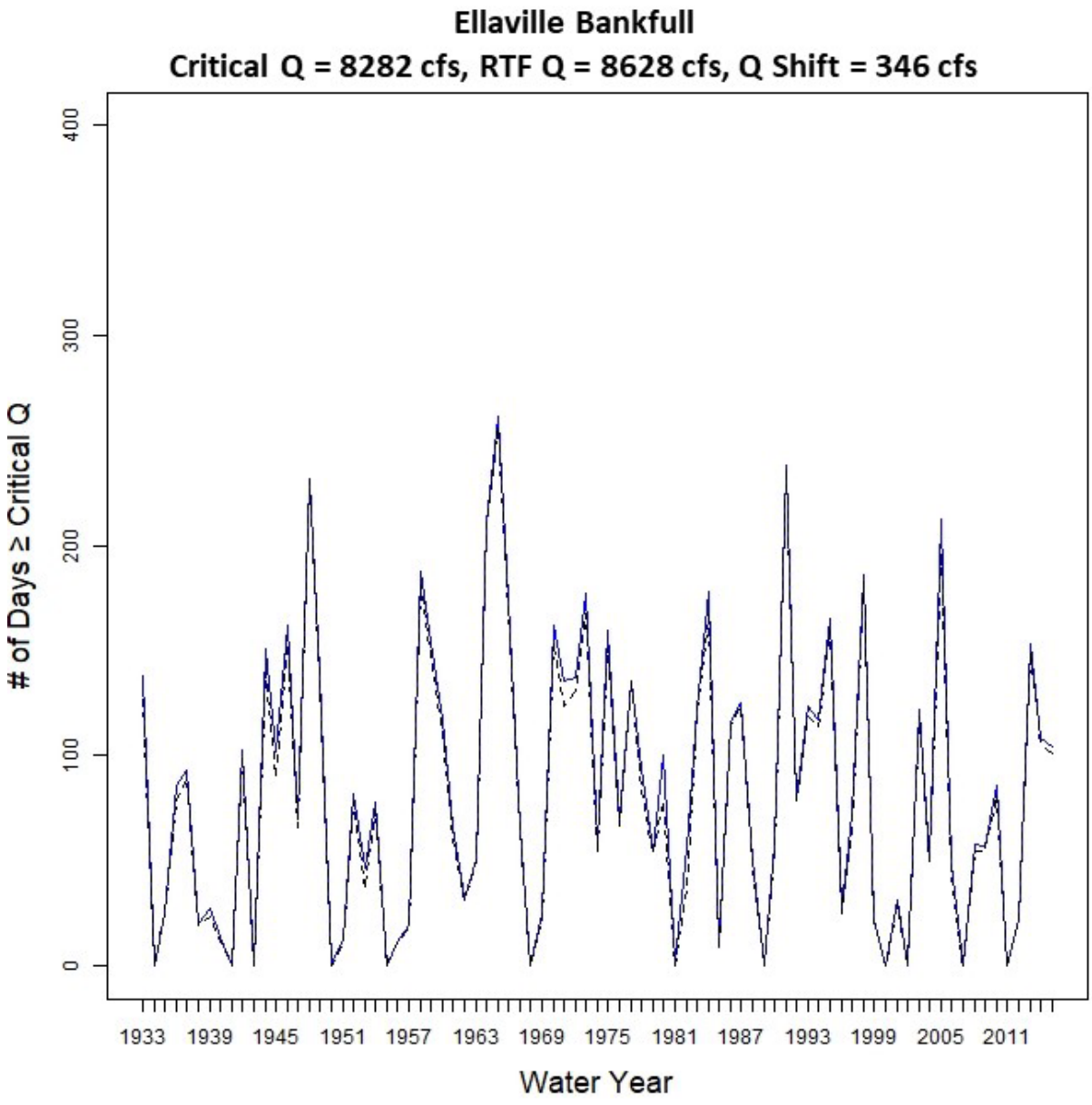

Figure 10 - Updated Ellaville Bankfull results:
Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

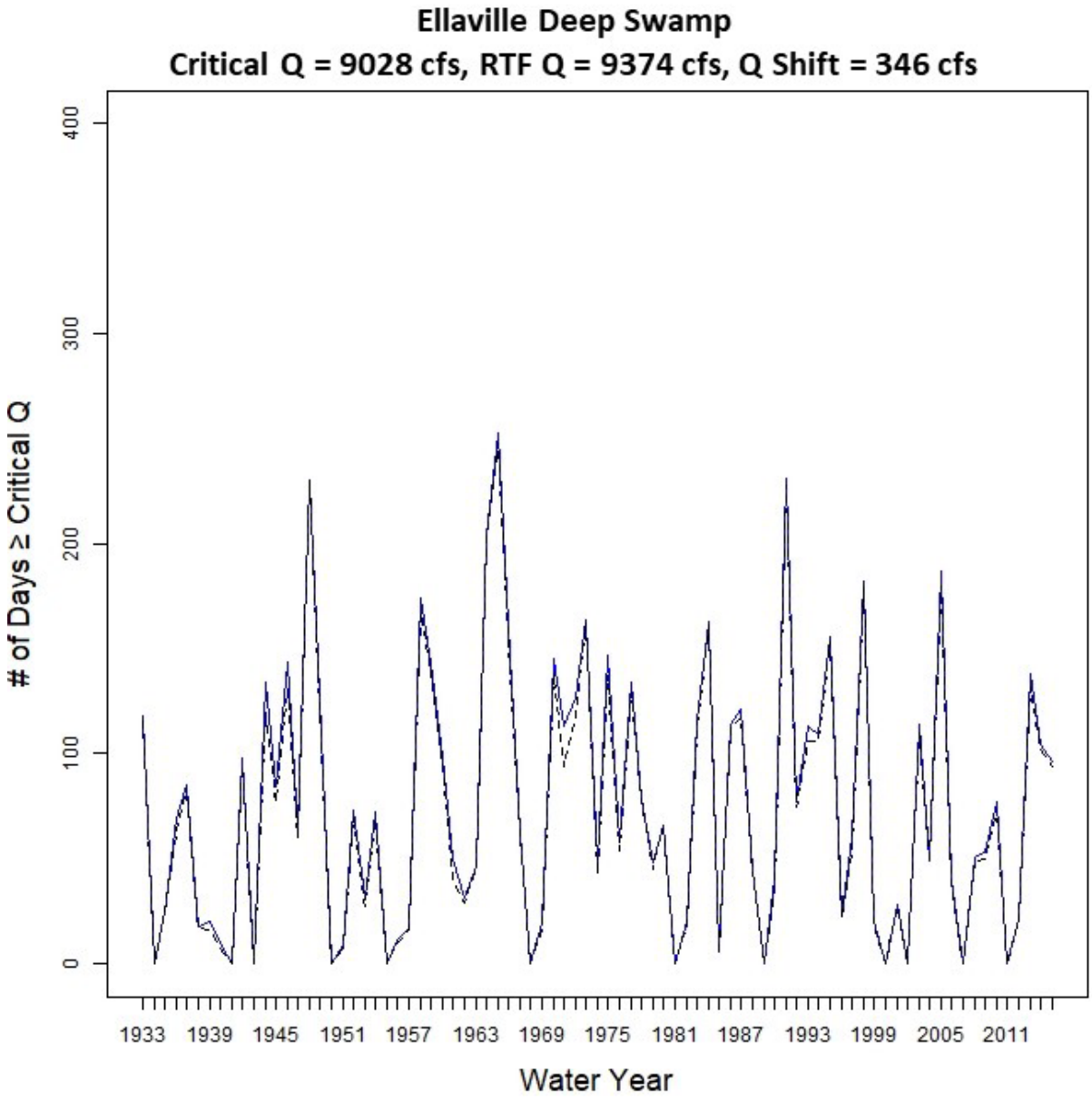

Figure 11 - Updated Ellaville Deep Swamp results:
Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

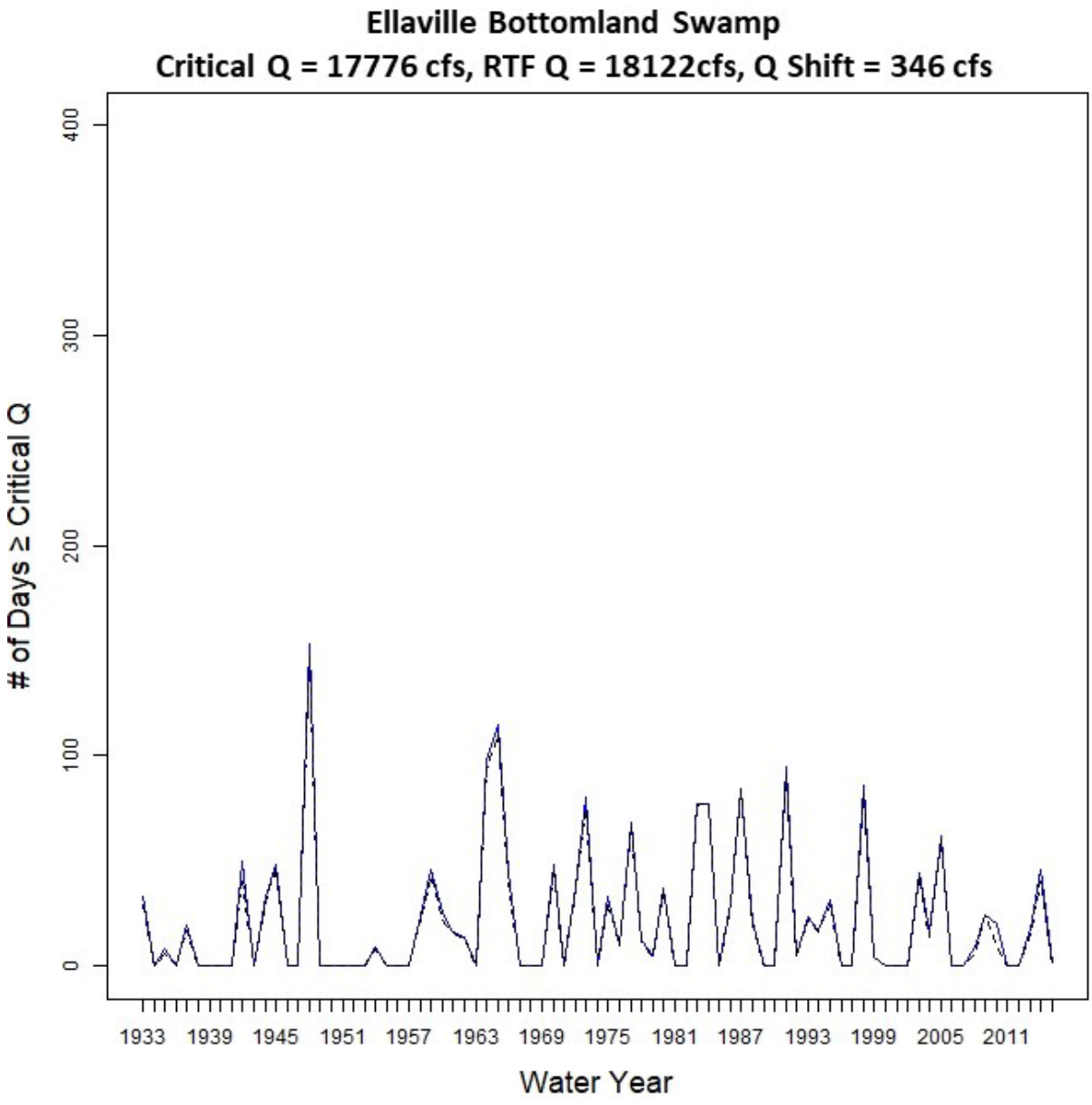

Figure 12 - Updated Ellaville Bottomland results:
Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

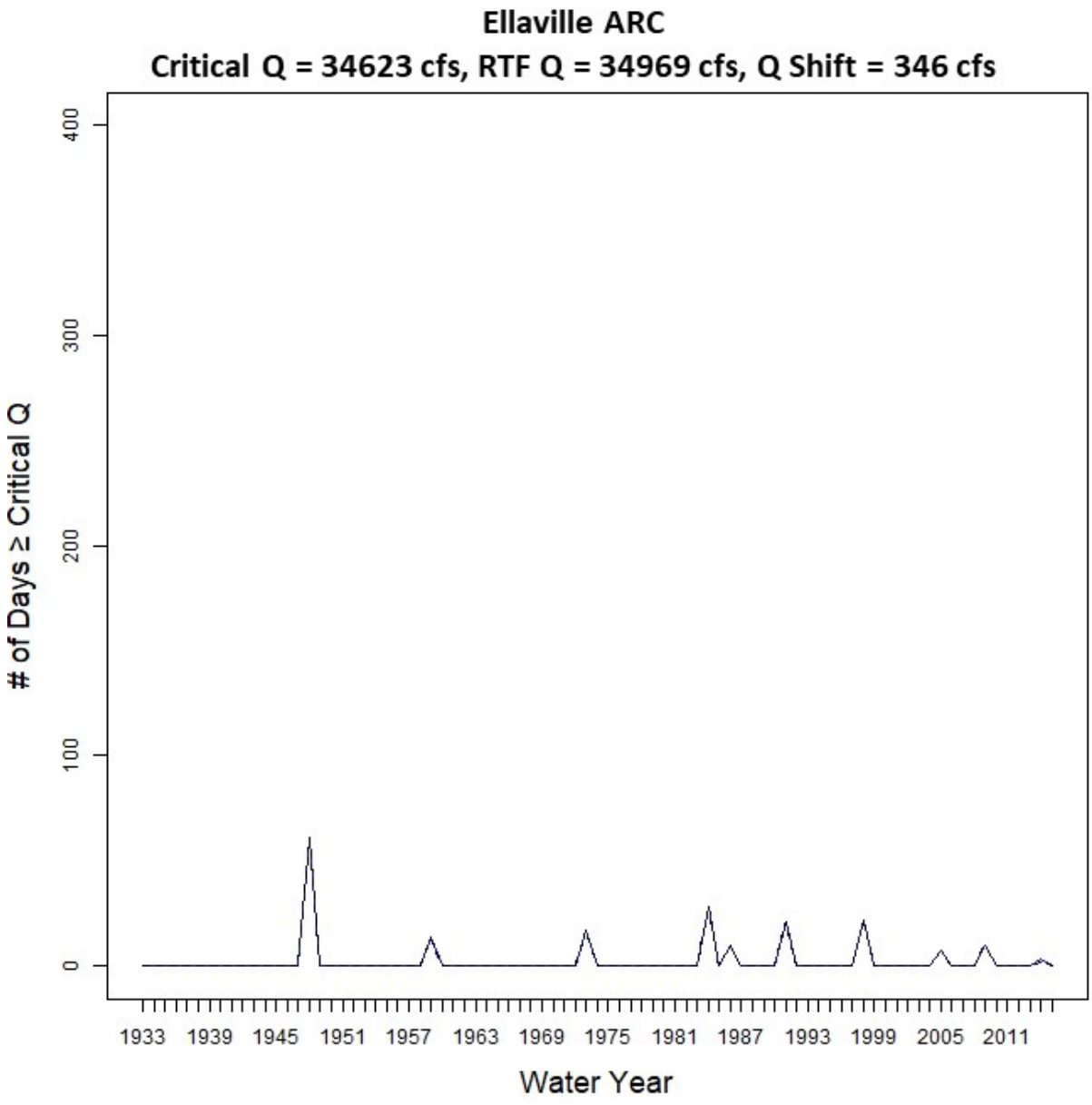

Figure 13 - Updated Ellaville ARC results:
Days per year above critical flow (solid line) and RTF flow reduced by 346 cfs (dashed line)

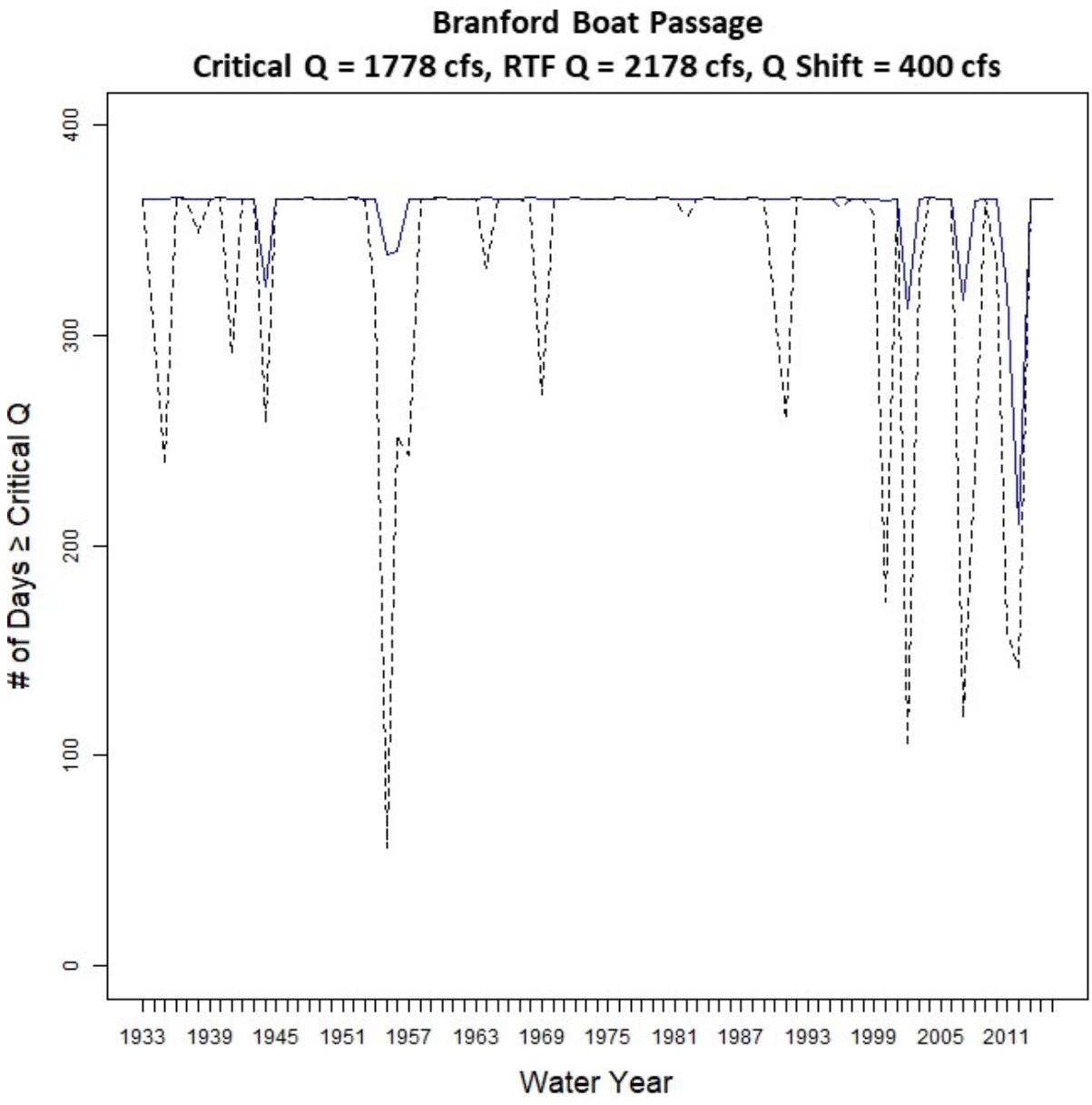

Figure 14 - Updated Branford Boat Passage results:
Days per year above critical flow (solid line) and RTF flow reduced by 400 cfs (dashed line)

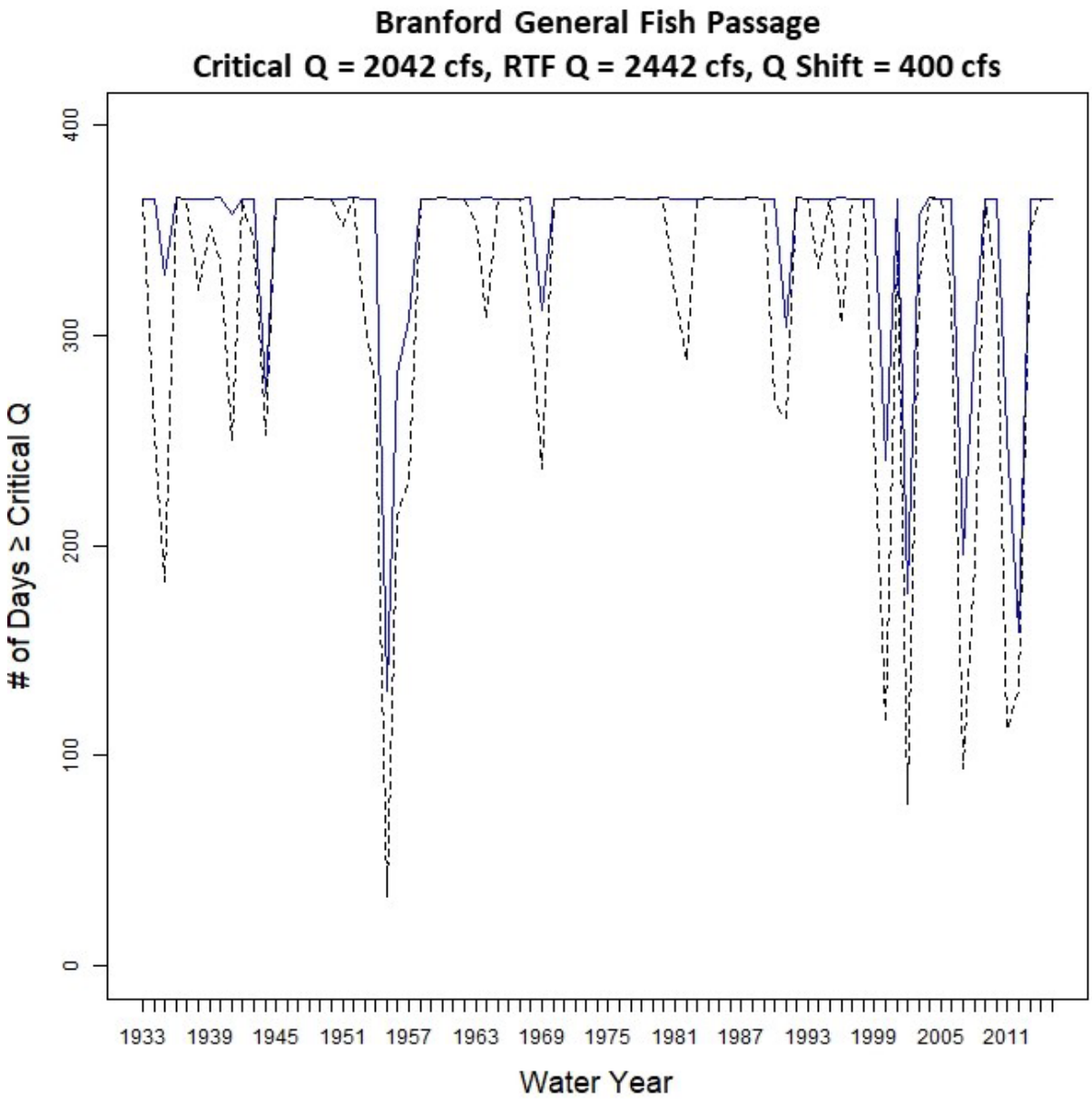

Figure 15 - Updated Branford General Fish Passage results:
Days per year above critical flow (solid line) and RTF flow reduced by 400 cfs (dashed line)

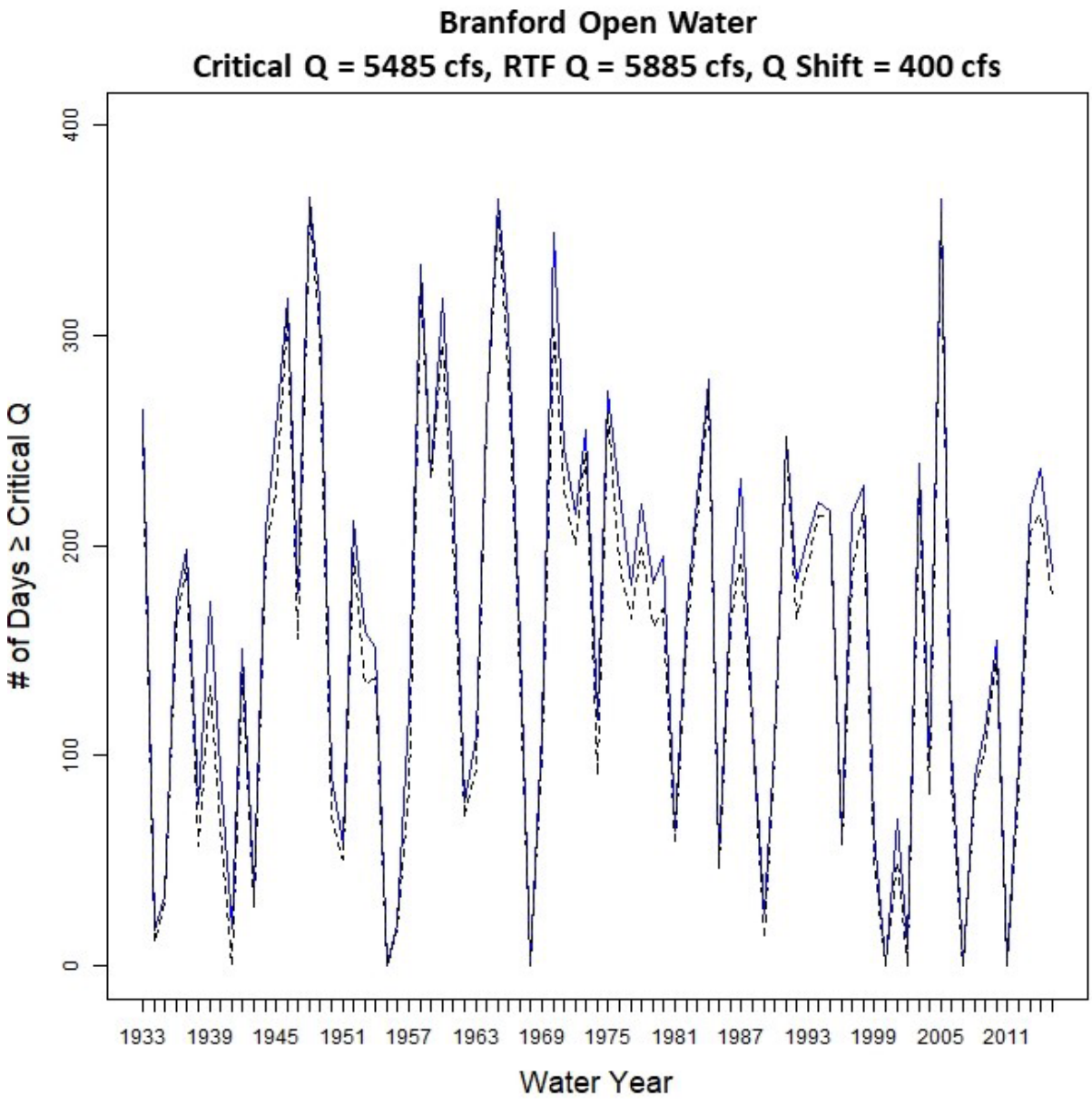

Figure 16 - Updated Branford Open Water results:
Days per year above critical flow (solid line) and RTF flow reduced by 400 cfs (dashed line)

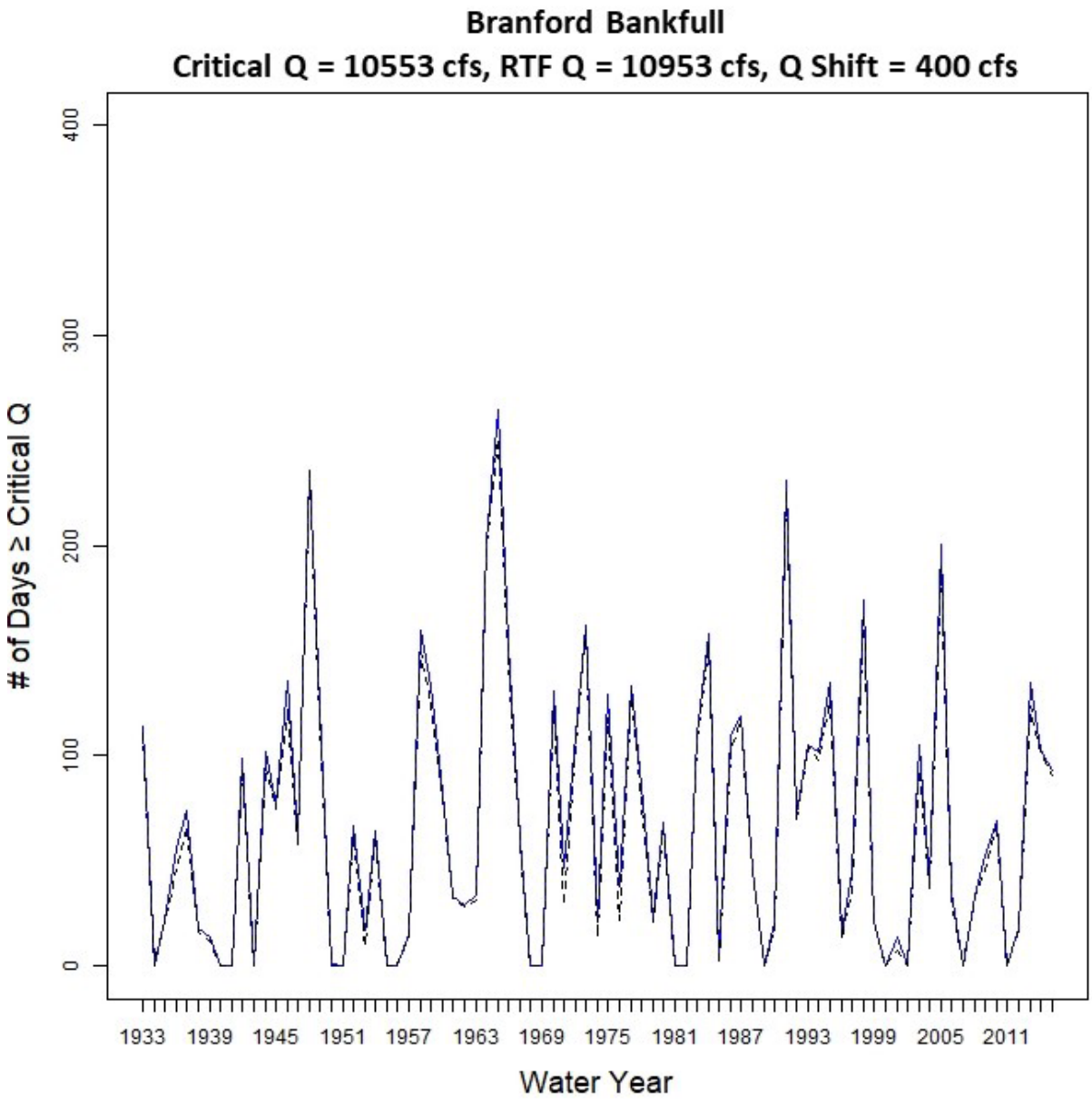

Figure 17 - Updated Branford Bankfull results:
Days per year above critical flow (solid line) and RTF flow reduced by 400 cfs (dashed line)

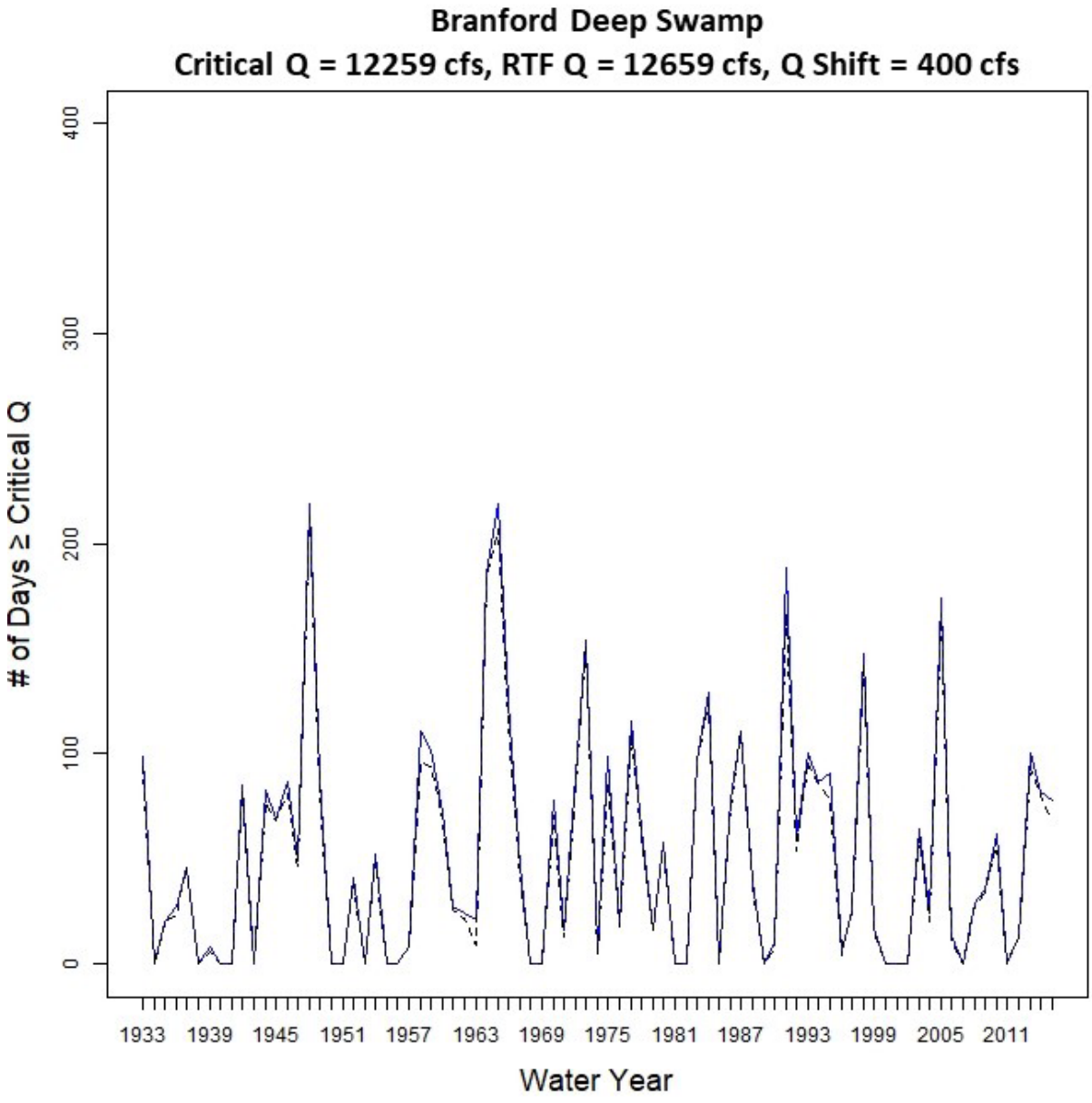

Figure 18 - Updated Branford Deep Swamp results:
Days per year above critical flow (solid line) and RTF flow reduced by 400 cfs (dashed line)

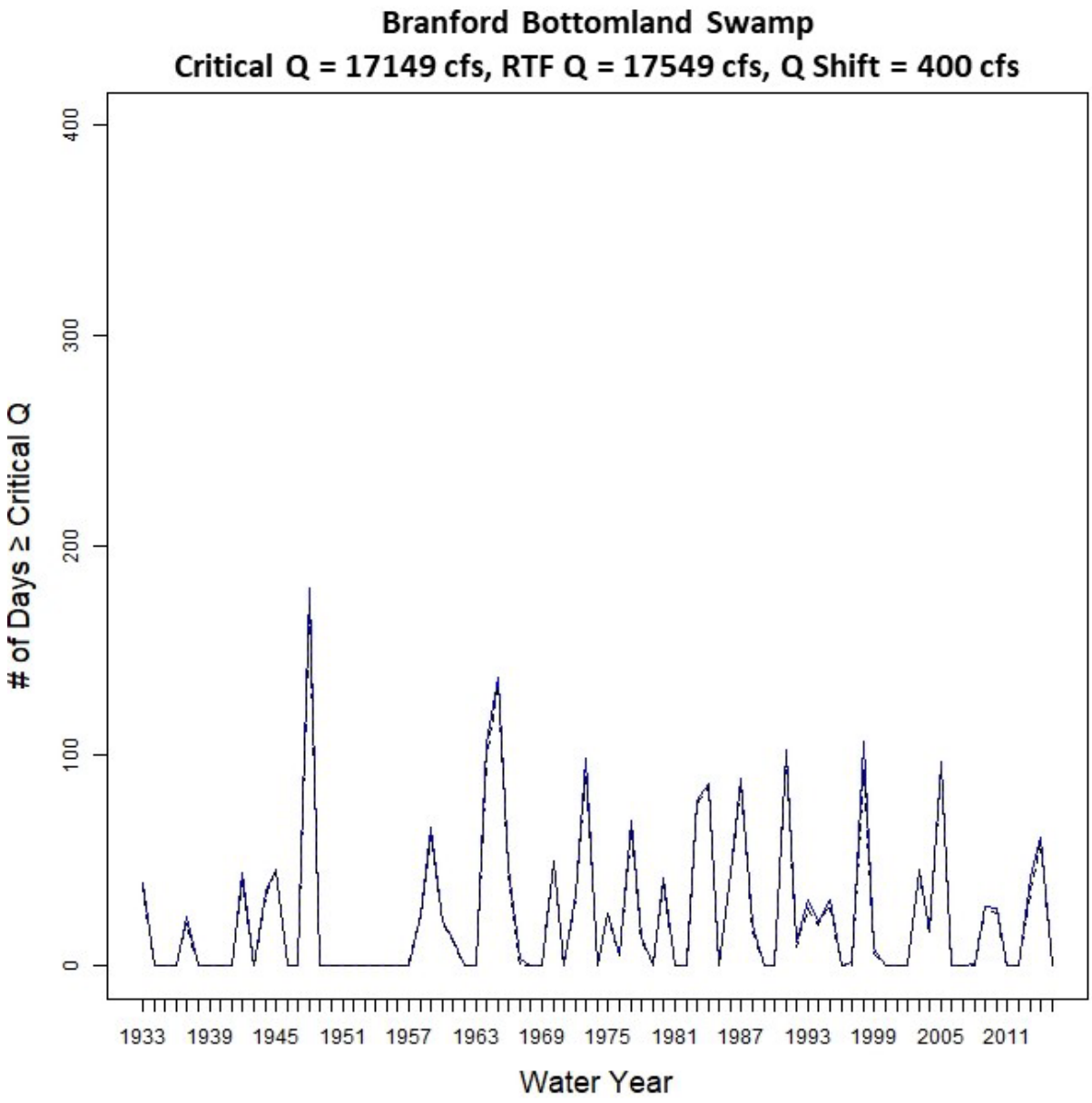

Figure 19 - Updated Branford Bottomland Swamp results:
Days per year above critical flow (solid line) and RTF flow reduced by 400 cfs (dashed line)

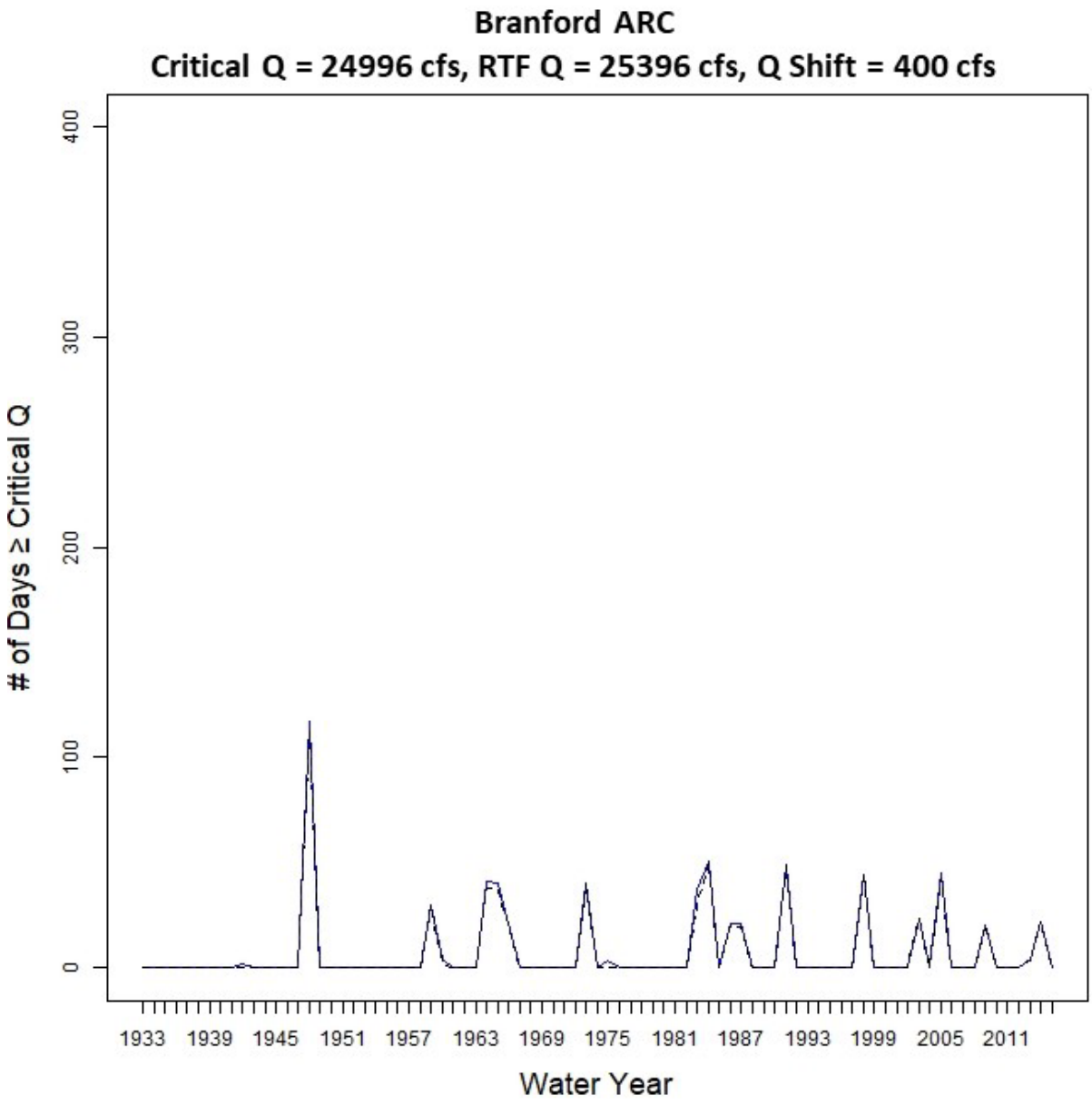

Figure 20 - Updated Branford ARC results:
Days per year above critical flow (solid line) and RTF flow reduced by 400 cfs (dashed line)