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Appendix E – Supplemental Water Quantity Analysis

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This appendix provides supplemental analyses supporting the surface water quantity and availability evaluation presented in the IWRP, expanding on Section 4 by providing additional detail on runoff dynamics, reservoir inflows, and low-flow conditions across the Basin.

Key outputs include subbasin-scale summaries of daily runoff characteristics over the full period of record, annual reservoir inflow variability, and changes in the duration and extent of low-flow conditions within stream networks. These results add quantitative detail to help interpret basin-wide trends and inform long-term water resource planning, infrastructure considerations, and resilience strategies under changing hydrologic conditions.

Table E-1 shows the average, standard deviation (St. Dev.), and maximum value of the maximum daily runoff in inches per acre simulated for each catchment within each subbasin. By normalizing the depth of runoff generated by area of the catchment, the values presented can be compared across subbasins even though the subbasins vary in area and number of catchments.

Table E-1. Maximum daily runoff (in/acre) across catchments within a subbasin by scenario over the entire period of record, summarizing average, standard deviation, and maximum values of daily maximum runoff.

Subbasin	Metric	Current	Future Land Use	Hot/Dry	Hot/Wet	Warm/Dry	Warm/Wet	Future Land Use & Hot/Dry	Future Land Use & Warm/Wet
James	Average	0.25	0.25	0.21	0.29	0.21	0.29	0.21	0.3
	St. Dev.	3.52	3.52	3.21	3.86	3.21	3.86	3.21	3.86
	Maximum	>16	>16	>16	>16	>16	>16	>16	>16
Rhodhiss	Average	0.08	0.08	0.07	0.09	0.07	0.09	0.07	0.09
	St. Dev.	0.61	0.61	0.54	0.68	0.54	0.68	0.54	0.68
	Maximum	15.9	15.9	14.22	17.77	14.22	17.77	14.22	17.77
Hickory	Average	0.11	0.11	0.1	0.13	0.1	0.13	0.1	0.13
	St. Dev.	0.6	0.6	0.53	0.68	0.53	0.68	0.53	0.68
	Maximum	6.23	6.23	5.28	7.33	5.28	7.33	5.28	7.33
Lookout Shoals	Average	0.06	0.06	0.05	0.07	0.05	0.07	0.05	0.07
	St. Dev.	0.34	0.34	0.3	0.38	0.3	0.38	0.3	0.38
	Maximum	3.97	3.97	3.63	4.35	3.63	4.35	3.63	4.35
Norman	Average	0.11	0.12	0.09	0.14	0.09	0.14	0.1	0.14
	St. Dev.	0.54	0.55	0.43	0.64	0.43	0.64	0.44	0.66
	Maximum	6.41	6.41	5	7.68	5	7.68	5	7.68
Mountain Island	Average	0.23	0.23	0.19	0.27	0.19	0.27	0.19	0.27
	St. Dev.	1.4	1.4	1.18	1.7	1.18	1.7	1.18	1.7
	St. Dev.	1.4	1.4	1.18	1.7	1.18	1.7	1.18	1.7
	Maximum	9.94	9.94	8.38	12.02	8.38	12.02	8.38	12.02
South Fork	Average	0.07	0.08	0.06	0.08	0.06	0.08	0.07	0.1
	St. Dev.	0.33	0.51	0.29	0.39	0.29	0.39	0.44	0.59
	Maximum	3.74	9.07	3.31	4.68	3.31	4.68	7.88	10.53

Subbasin	Metric	Current	Future Land Use	Hot/Dry	Hot/Wet	Warm/Dry	Warm/Wet	Future Land Use & Hot/Dry	Future Land Use & Warm/Wet
	Maximum	3.74	9.07	3.31	4.68	3.31	4.68	7.88	10.53
Wylie	Average	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.04
	St. Dev.	0.15	0.16	0.13	0.19	0.13	0.19	0.13	0.19
	St. Dev.	0.15	0.16	0.13	0.19	0.13	0.19	0.13	0.19
	Maximum	1.71	1.71	1.47	2	1.47	2.0.	1.47	2
Fishing Creek	Average	0.09	0.09	0.07	0.1	0.07	0.1	0.07	0.11
	St. Dev.	0.45	0.45	0.39	0.53	0.39	0.53	0.4	0.54
	Maximum	7.98	7.98	7.38	9.92	7.38	9.92	7.38	9.92
	Maximum	7.98	7.98	7.38	9.92	7.38	9.92	7.38	9.92
Great Falls/ Cedar Creek	Average	0.45	0.45	0.4	0.5	0.4	0.5	0.4	0.5
	St. Dev.	1.28	1.28	1.16	1.43	1.16	1.43	1.16	1.42
	St. Dev.	1.28	1.28	1.16	1.43	1.16	1.43	1.16	1.42
	Maximum	8.96	8.96	8.19	9.9	8.19	9.9	8.19	9.9
Wateree	Average	0.04	0.04	0.03	0.04	0.03	0.04	0.03	0.04
	St. Dev.	0.15	0.15	0.13	0.17	0.13	0.17	0.13	0.17
	Maximum	2.16	2.16	1.93	2.71	1.93	2.71	1.93	2.71
	Maximum	2.16	2.16	1.93	2.71	1.93	2.71	1.93	2.71
Below Wateree	Average	0.19	0.2	0.17	0.23	0.17	0.23	0.18	0.25
	St. Dev.	1.03	1.06	0.93	1.26	0.93	1.26	0.96	1.3
	St. Dev.	1.03	1.06	0.93	1.26	0.93	1.26	0.96	1.3
	Maximum	14.44	14.44	13.06	17.63	13.06	17.63	13.06	17.63

Figures E-1 through E-10 display the annual total reservoir inflow, where each bar represents a year, for each reservoir for the Current scenario and the two projected future scenarios combining land use and climate changes. Note that the releases from the upstream reservoir were taken from the more generalized WaterFALL reservoir simulation rather than the CHEOPS simulation.

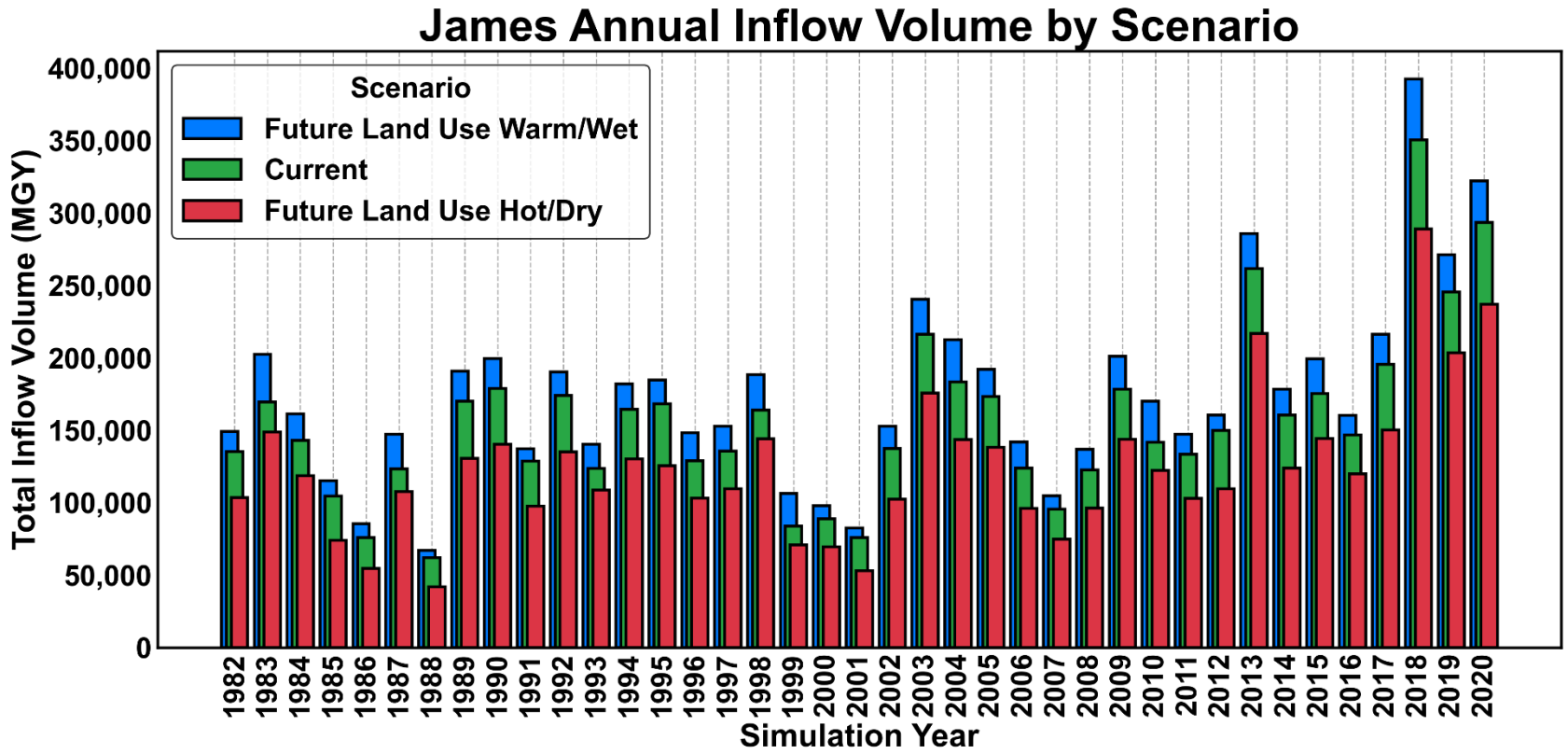


Figure E-1. Lake James Annual Inflow Volume.

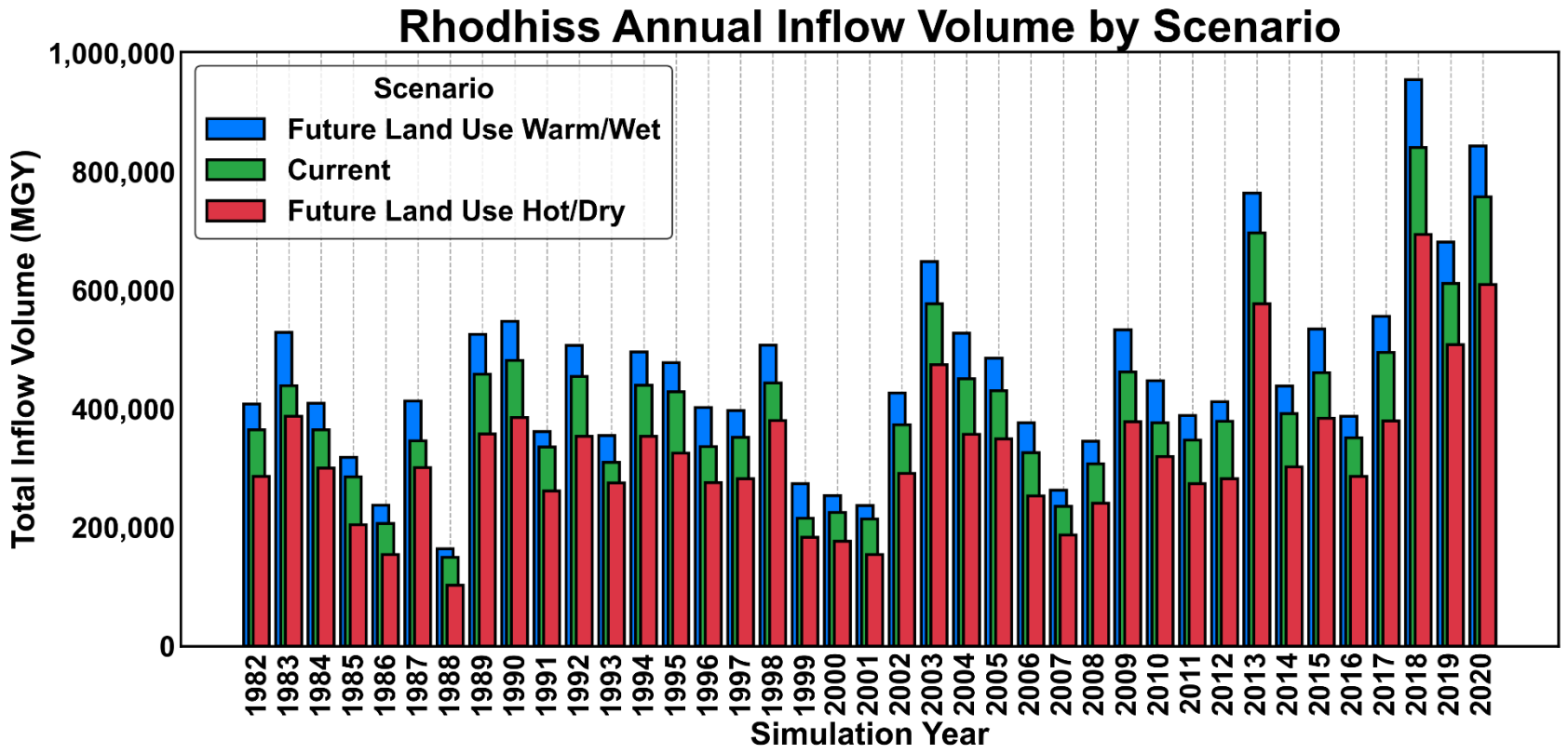


Figure E-2. Lake Rhodhiss Annual Inflow Volume.

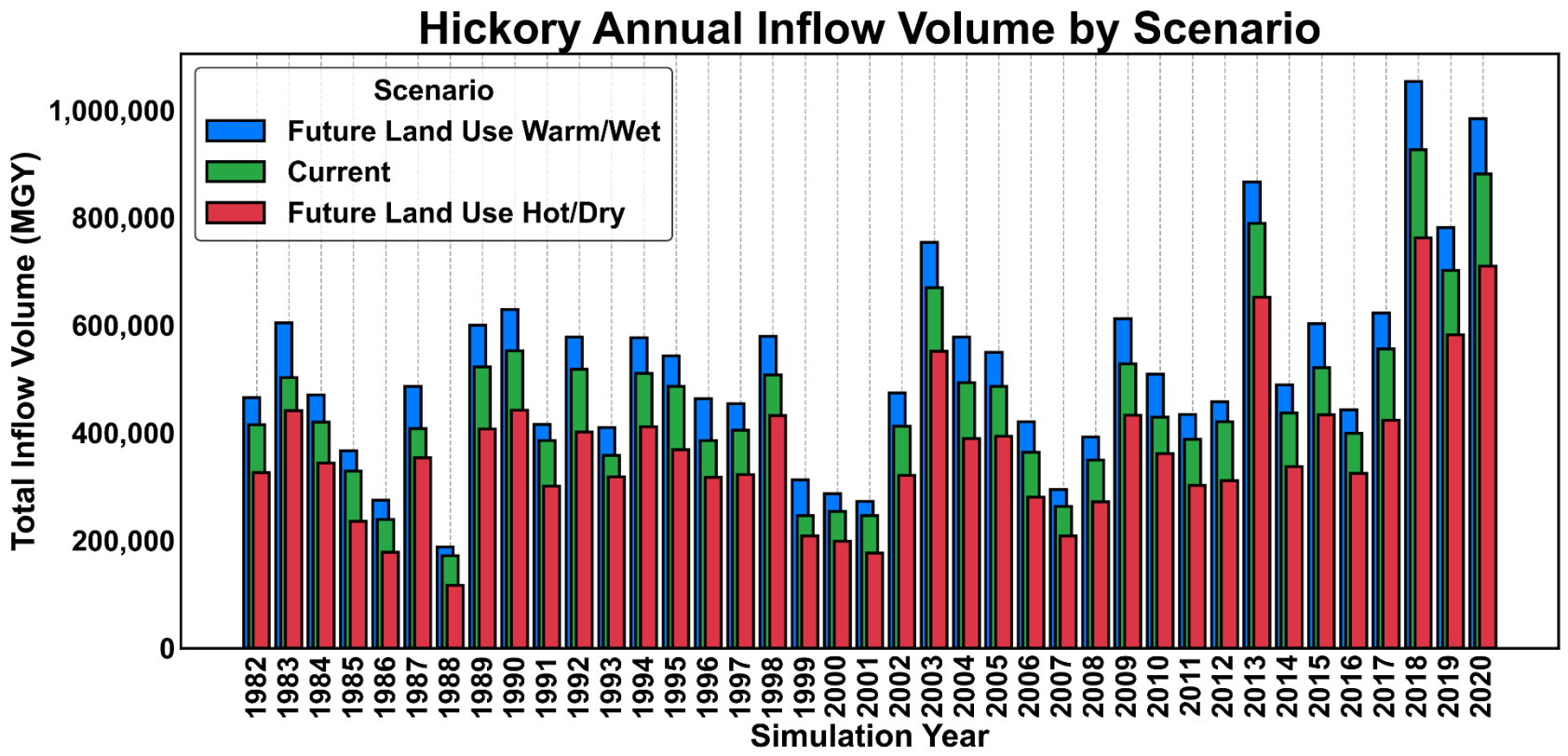


Figure E-3. Lake Hickory Annual Inflow Volume.

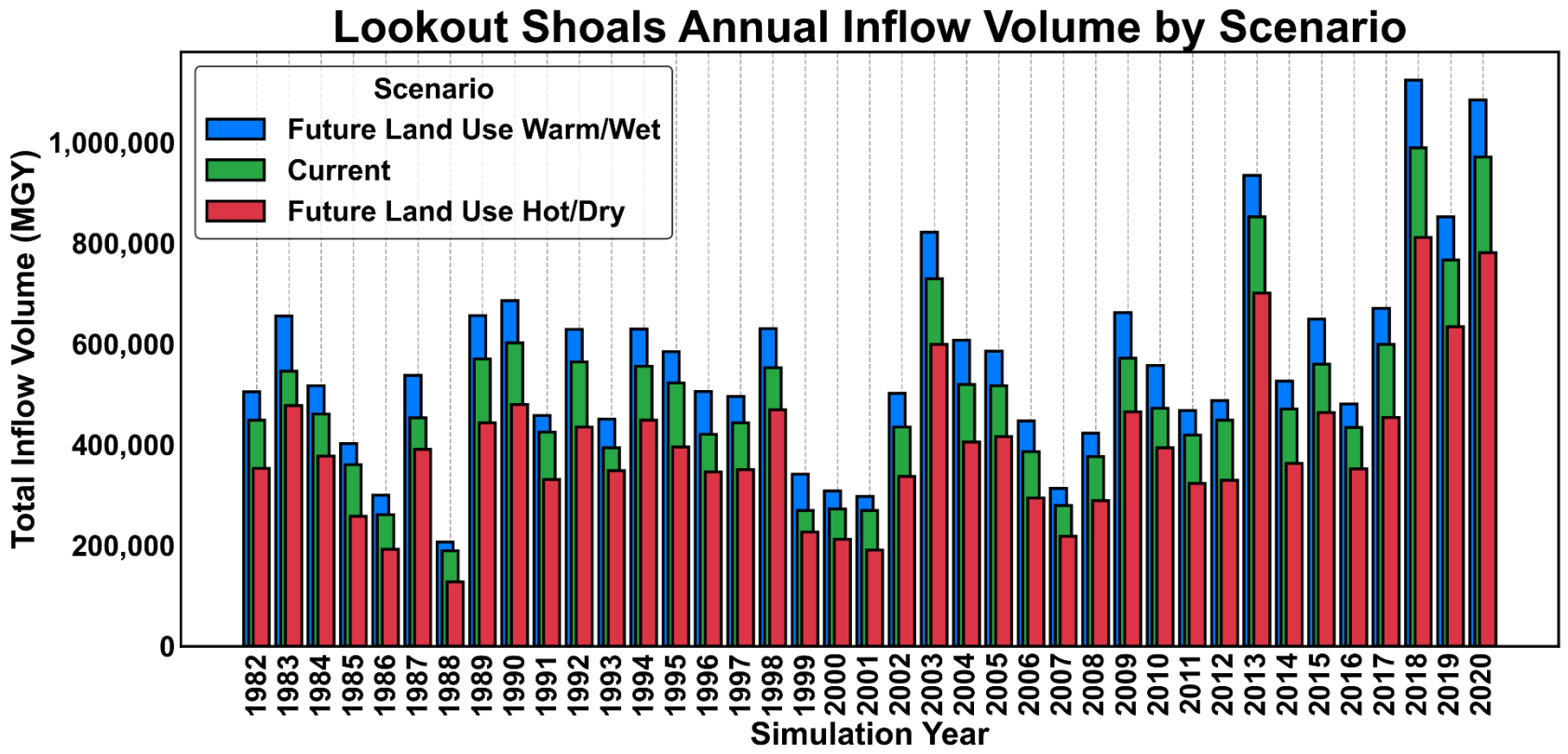


Figure E-4. Lookout Shoals Annual Inflow Volume.

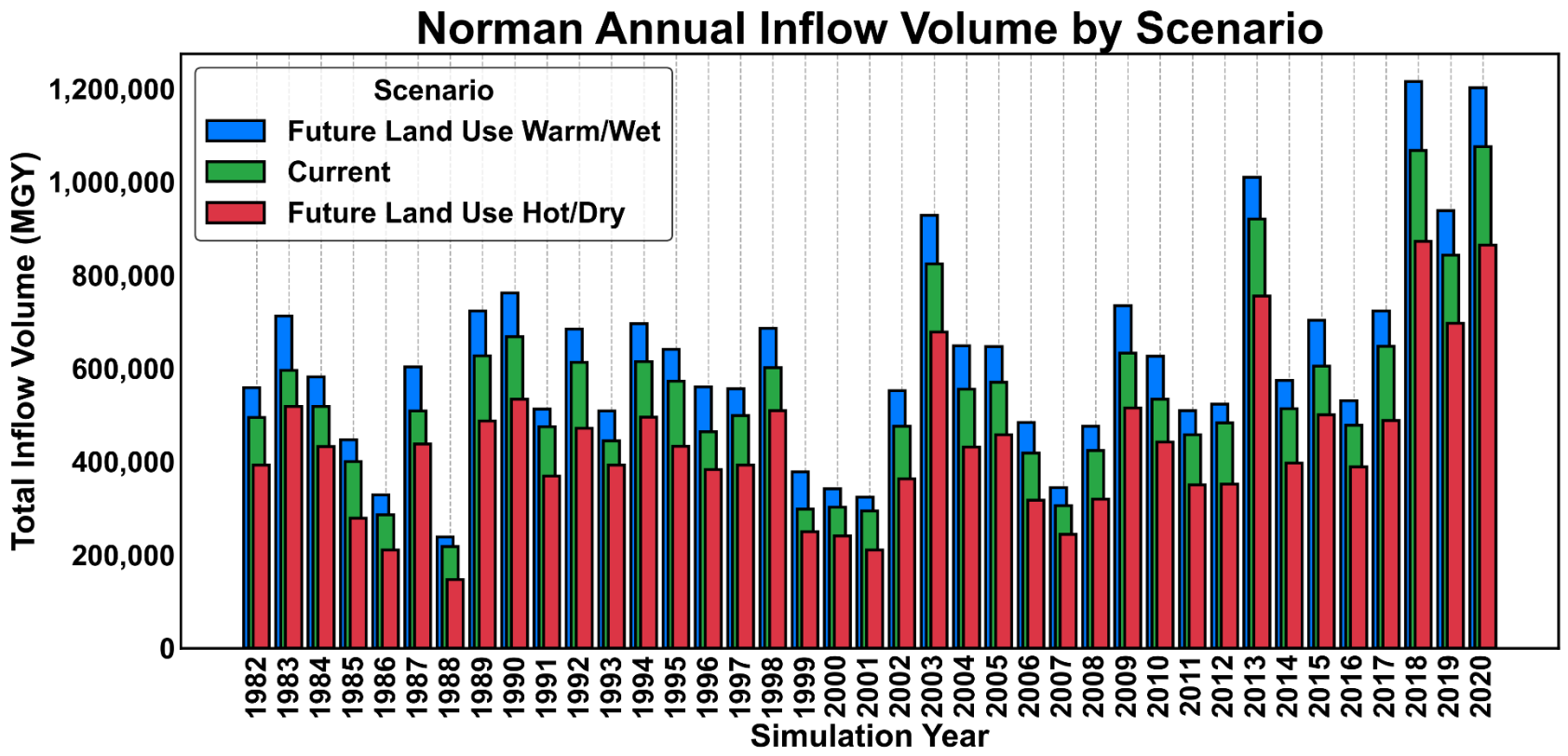


Figure E-5. Lake Norman Annual Inflow Volume.

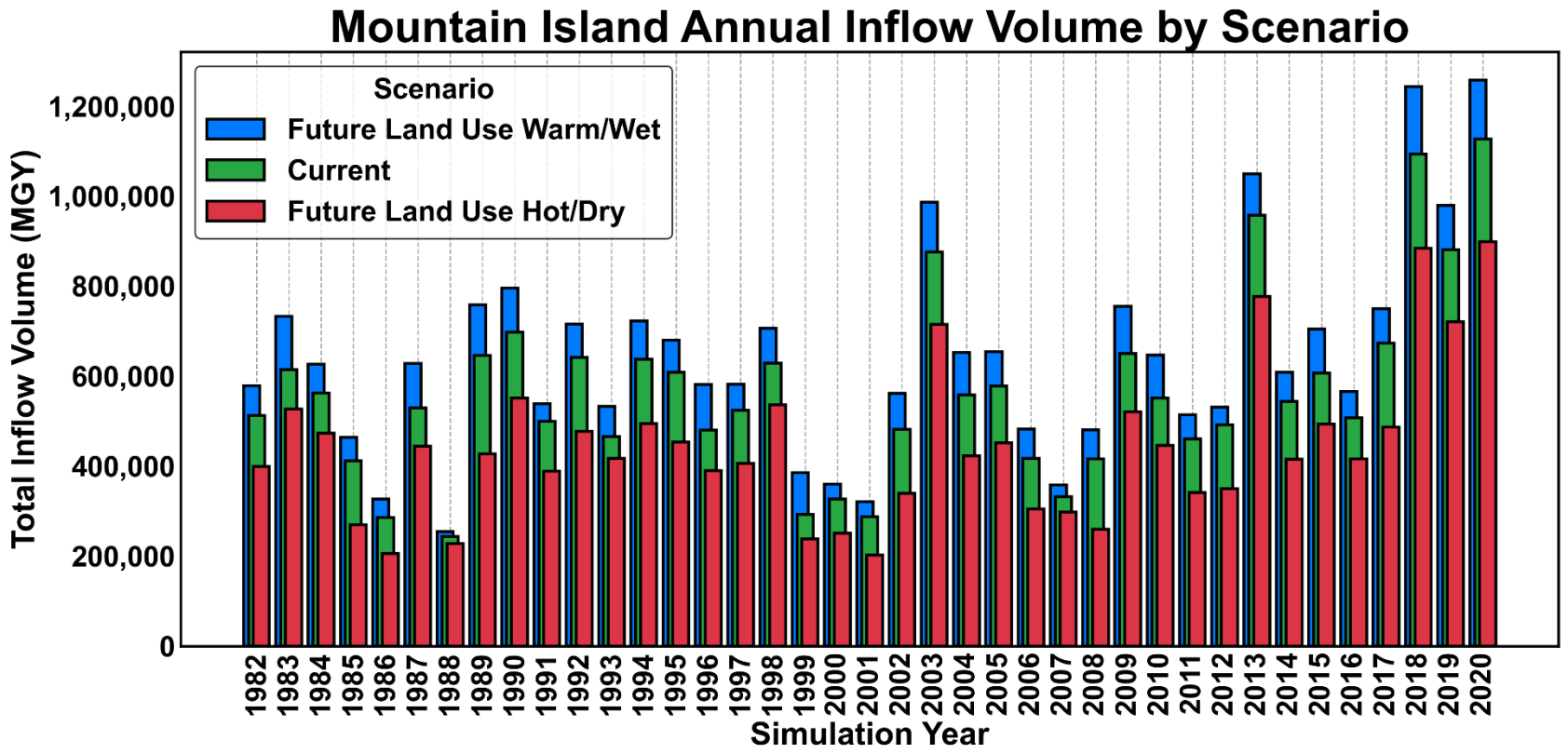


Figure E-6. Mountain Island Lake Annual Inflow Volume.

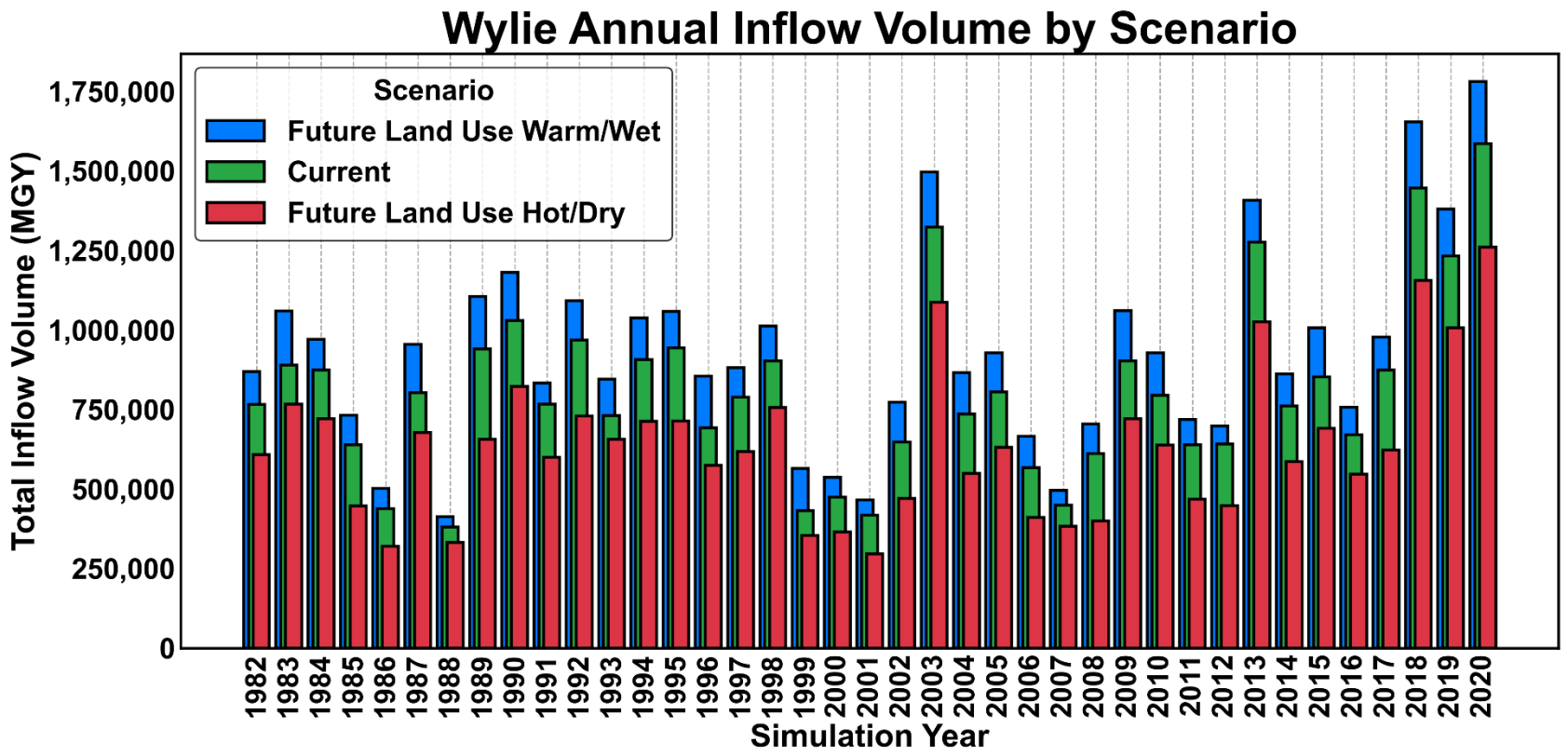


Figure E-7. Lake Wylie Annual Inflow Volume.

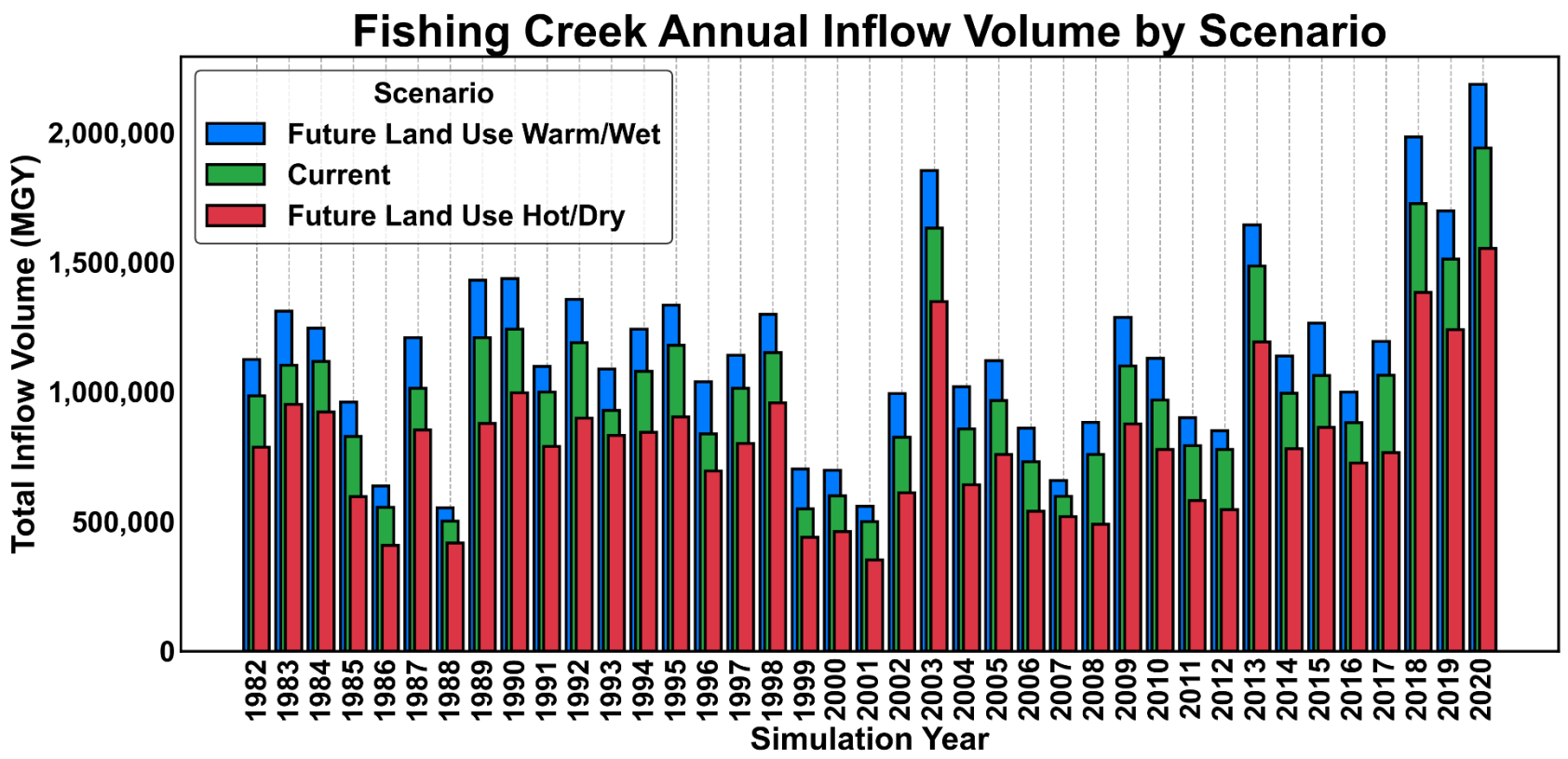


Figure E-8. Fishing Creek Reservoir Annual Inflow Volume.

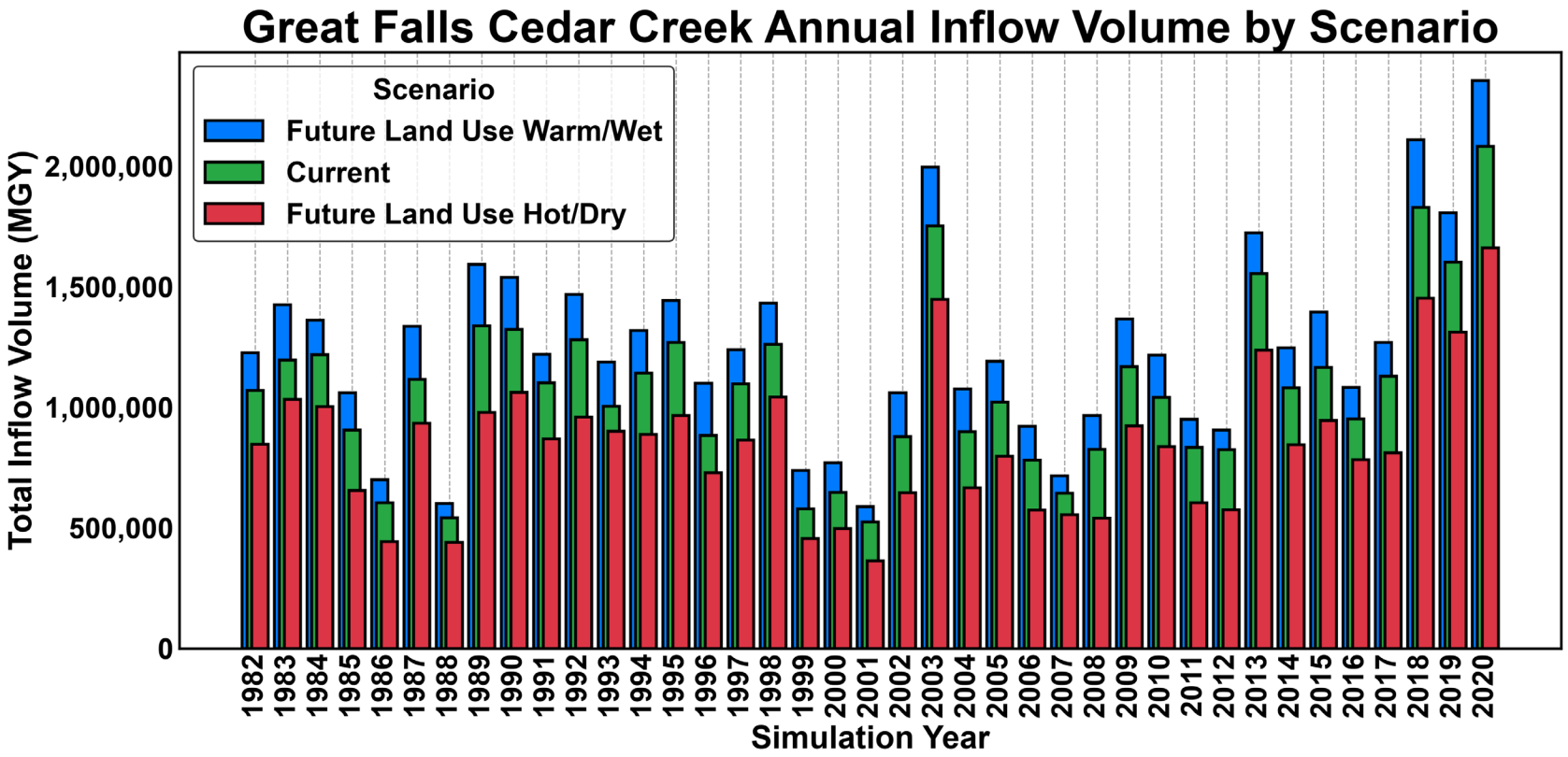


Figure E-9. Great Falls/ Cedar Creek Reservoir Annual Inflow Volume.

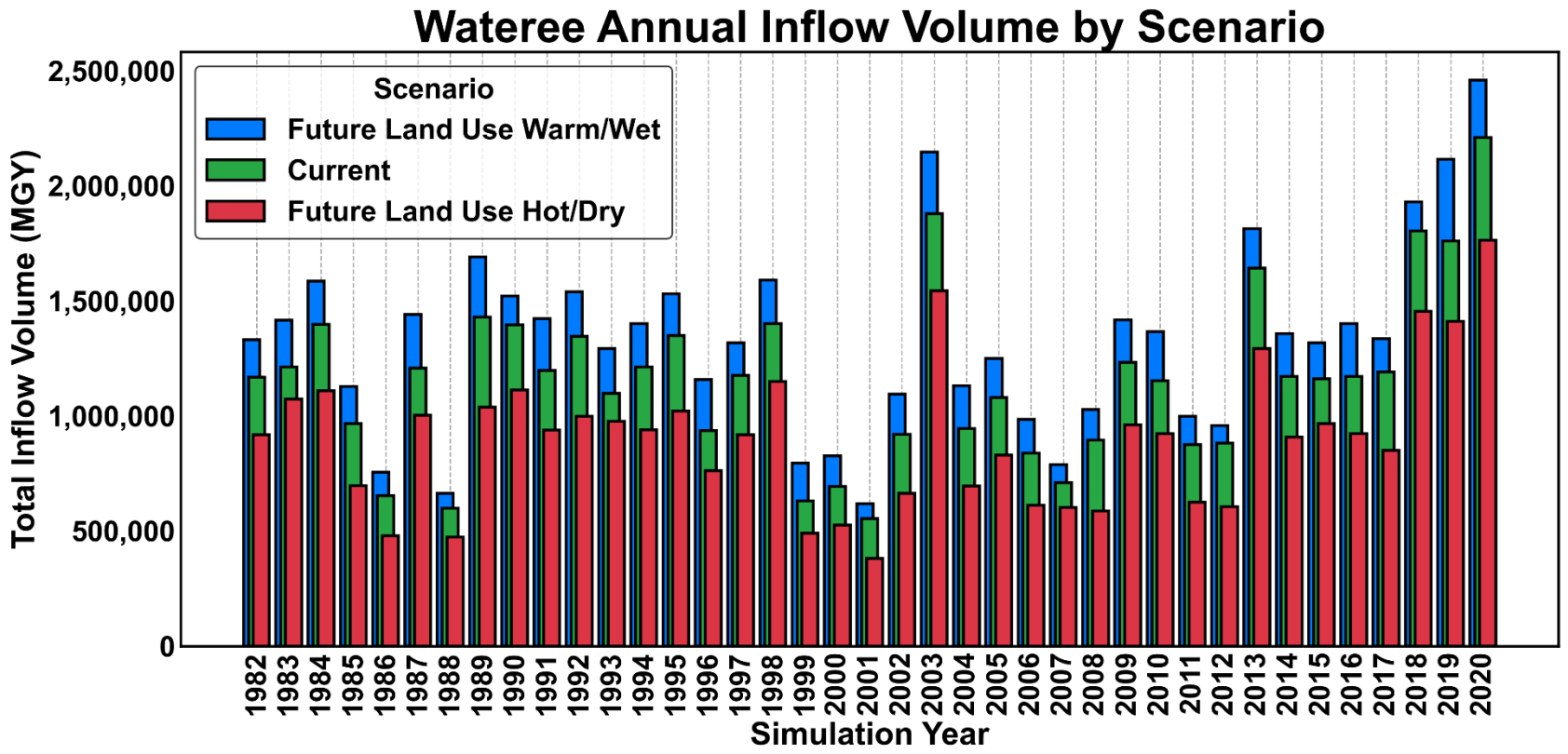


Figure E-10. Lake Wateree Annual Inflow Volume.

Table E-2 provides the stream miles for each subbasin and the Basin overall that are expected to increase in duration under projected future conditions. Low flows are those that fall below the 25th percentile of long-term daily flow, where the duration for each event is measured as consecutive days of streamflow below that threshold. Four rating categories were established to denote the severity of the duration where minor increases have annual average low flow event durations that increase by less than two days, and significant increases are those catchments with events that extend in duration by three or more days on average in a year. Each catchment in the Basin is assessed for low flow duration, and the length of each stream reach is summed for the corresponding rating category.

Table E-2 Length of Rivers/Streams (miles) Experiencing Increased Durations of Low Flows within a Subbasin by Scenario

Subbasin	Rating	Future Land Use	Hot/ Dry	Hot/ Wet	Warm/ Dry	Warm/ Wet	Future Land Use & Hot/ Dry	Future Land Use & Warm/ Wet
James	No Increase	471	0	35	0	68	0	74
	Minor Increase	61	5	254	27	313	7	305
	Increase	0	59	159	124	118	57	118
	Significant Increase	0	468	84	381	33	468	36
	Total Increase	**61 (11%)**	**532 (100%)**	**497 (93%)**	**532 (100%)**	**464 (87%)**	**532 (100%)**	**459 (86%)**
Rhodhiss	No Increase	822	1	286	9	296	10	311
	Minor Increase	209	389	574	528	599	408	586
	Increase	0	375	138	334	120	355	119
	Significant Increase	0	265	33	160	15	258	15
	Total Increase	**209 (20%)**	**1,029 (100%)**	**745 (72%)**	**1,022 (99%)**	**734 (71%)**	**1,021 (99%)**	**720 (70%)**
Hickory	No Increase	172	0	20	0	20	0	21
	Minor Increase	78	18	219	34	222	24	219
	Increase	0	51	8	61	4	49	6
	Significant Increase	0	181	2	155	4	177	4
	Total Increase	**78 (31%)**	**250 (100%)**	**229 (92%)**	**250 (100%)**	**230 (92%)**	**250 (100%)**	**229 (92%)**
Lookout Shoals	No Increase	112	0	1	0	13	0	11
	Minor Increase	60	0	139	16	149	2	151
	Increase	0	28	28	59	8	33	8

Subbasin	Rating	Future Land Use	Hot/ Dry	Hot/ Wet	Warm/ Dry	Warm/ Wet	Future Land Use & Hot/ Dry	Future Land Use & Warm/ Wet
	Significant Increase	0	143	4	96	2	136	2
	Total Increase	**60 (35%)**	**171 (100%)**	**171 (99%)**	**171 (100%)**	**159 (92%)**	**171 (100%)**	**161 (94%)**
Norman	No Increase	147	3	43	2	48	9	51
	Minor Increase	112	18	196	23	208	17	199
	Increase	0	11	15	27	3	16	10
	Significant Increase	0	227	6	208	0	217	0
	Total Increase	**112 (43%)**	**256 (99%)**	**217 (83%)**	**258 (99%)**	**211 (81%)**	**250 (97%)**	**209 (80%)**
Mountain Island	No Increase	46	0	46	2	41	9	46
	Minor Increase	9	20	8	21	13	12	8
	Increase	0	6	0	7	0	6	0
	Significant Increase	0	28	0	26	0	27	0
	Total Increase	**9 (16%)**	**54 (100%)**	**8 (15%)**	**54 (96%)**	**13 (24%)**	**45 (83%)**	**8 (15%)**
South Fork	No Increase	420	0	91	0	106	1	116
	Minor Increase	301	136	599	236	599	151	577
	Increase	0	190	29	169	16	194	27
	Significant Increase	0	395	2	316	0	375	0
	Total Increase	**301 (42%)**	**721 (100%)**	**630 (87%)**	**721 (100%)**	**615 (85%)**	**720 (100%)**	**604 (84%)**
Wylie	No Increase	292	3	180	5	180	43	224
	Minor Increase	90	76	191	77	192	42	150
	Increase	0	25	10	42	9	41	6
	Significant Increase	0	278	1	258	2	255	2
	Total Increase	**90 (24%)**	**379 (99%)**	**202 (53%)**	**377 (99%)**	**203 (53%)**	**338 (89%)**	**158 (41%)**
Fishing Creek	No Increase	739	42	551	41	678	154	703
	Minor Increase	271	275	421	309	315	226	287
	Increase	0	154	32	168	15	138	16
	Significant Increase	0	538	6	491	3	492	4
	Total Increase	**271 (27%)**	**967 (96%)**	**459 (45%)**	**968 (96%)**	**333 (33%)**	**856 (85%)**	**307 (30%)**
	No Increase	380	19	475	18	476	114	471

Subbasin	Rating	Future Land Use	Hot/ Dry	Hot/ Wet	Warm/ Dry	Warm/ Wet	Future Land Use & Hot/ Dry	Future Land Use & Warm/ Wet
Great Falls/ Cedar Creek	Minor Increase	91	288	2	282	1	224	6
	Increase	1	59	0	75	0	60	0
	Significant Increase	4	112	0	101	0	78	0
	Total Increase	**96 (20%)**	**459 (96%)**	**2 (0%)**	**458 (96%)**	**1 (0%)**	**362 (76%)**	**6 (1%)**
Wateree	No Increase	424	0	268	0	331	0	326
	Minor Increase	64	0	175	2	144	0	146
	Increase	1	2	35	17	12	2	16
	Significant Increase	0	487	12	470	2	487	1
	Total Increase	**65 (13%)**	**489 (100%)**	**222 (45%)**	**489 (100%)**	**158 (32%)**	**489 (100%)**	**163 (33%)**
Below Wateree	No Increase	824	6	614	7	752	6	764
	Minor Increase	252	90	434	185	309	99	297
	Increase	1	163	15	193	10	173	11
	Significant Increase	0	818	14	691	6	799	5
	Total Increase	**253 (23%)**	**1,071 (99%)**	**463 (43%)**	**1,069 (99%)**	**325 (30%)**	**1,071 (99%)**	**313 (29%)**
Full Basin	No Increase	4,849	74	2,610	84	3,009	346	3,118
	Minor Increase	1,598	1,315	3,212	1,740	3,064	1,212	2,931
	Increase	3	1,123	469	1,276	315	1,124	337
	Significant Increase	4	3,940	164	3,353	67	3,769	69
	Total Increase	**1,605 (25%)**	**6,378 (99%)**	**3,845 (60%)**	**6,369 (99%)**	**3,446 (53%)**	**6,105 (95%)**	**3,337 (52%)**

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