

1 **Table S1.1** Evaluation statistics for percentile interpolation before and after DA for the 7-day window.

Basin name	Forecast error variance (P)	R-RMSE	R	NSE	Bias	CRPS
Crystal River	No DA	0.1237	0.9312	0.8316	-16.64	34.92
	P	0.1165	0.945	0.8506	-14.48	32.82
	1/2·P	0.1185	0.9427	0.8456	-15.71	33.15
	2·P	0.1147	0.9457	0.8553	-12.35	32.72
Vallecito River	No DA	0.1101	0.9708	0.8736	-33.89	29.95
	P	0.106	0.9703	0.8829	-29.54	29.21
	1/2·P	0.1077	0.9709	0.8792	-31.12	29.3
Greys River	2·P	0.1036	0.9685	0.8881	-27.22	29.2
	No DA	0.1131	0.9522	0.8874	-2.98	18.67
	P	0.0984	0.9647	0.9147	-0.29	16.22
	1/2·P	0.1039	0.9601	0.905	-1.39	17.01
SF Tolt River	2·P	0.0924	0.9699	0.9249	1.18	15.55
	No DA	0.2423	0.7595	0.467	81.64	176.98
	P	0.1833	0.8633	0.6951	83.23	128.86
	1/2·P	0.1957	0.8384	0.6524	77.07	137.26
SF Payette River	2·P	0.1821	0.8752	0.6989	96.36	128.91
	No DA	0.1238	0.9629	0.8947	-26.77	29.43
	P	0.1221	0.9645	0.8976	-27.11	30.29
	1/2·P	0.1227	0.9653	0.8967	-27.94	30.12
Smith River	2·P	0.1217	0.9622	0.8983	-25.24	30.45
	No DA	0.211	0.8715	0.7223	-28.5	76.42
	P	0.1778	0.9085	0.8029	-25.80	66.25
	1/2·P	0.1885	0.8976	0.7784	-27.06	70.1
General Creek	2·P	0.1658	0.9195	0.8285	-23.47	61.84
	No DA	0.1178	0.9782	0.9523	-15.54	36.64
	P	0.0843	0.9897	0.9756	-14.14	28.6
	1/2·P	0.0923	0.9878	0.9707	-16.23	30.01
Blackwood Creek	2·P	0.0803	0.99	0.9778	-10.54	28.93
	No DA	0.1274	0.9764	0.9346	-52.44	55.12
	P	0.1077	0.9859	0.9532	-52.27	48.16
	1/2·P	0.112	0.9849	0.9495	-54.49	48.64
Merced River	2·P	0.1052	0.9856	0.9554	-48.54	49.11
	No DA	0.266	0.952	0.7369	-105.4	83.41
	P	0.2423	0.9489	0.7818	-95.68	78.71
	1/2·P	0.2494	0.9507	0.7688	-99.83	80.22
	2·P	0.234	0.9476	0.7964	-90.24	75.74

3 **Table S1.2** Evaluation statistics for Z-score interpolation before and after DA for the 7-day window.

Basin name	Forecast error variance (P)	R-RMSE	R	NSE	Bias	CRPS
Crystal River	No DA	0.1237	0.9312	0.8316	-16.64	34.92
	P	0.1215	0.9418	0.8377	-17.92	34.59
	1/2·P	0.1221	0.9396	0.836	-17.97	34.59
	2·P	0.1206	0.9432	0.8399	-17.37	34.43
Vallecito River	No DA	0.1101	0.9708	0.8736	-33.89	29.95
	P	0.1062	0.9754	0.8824	-32.22	30.33
	1/2·P	0.1073	0.9746	0.8799	-32.88	30.15
Greys River	2·P	0.1053	0.975	0.8844	-31.28	30.25
	No DA	0.1131	0.9522	0.8874	-2.98	18.67
	P	0.0973	0.9658	0.9167	-2.59	16.4
	1/2·P	0.102	0.962	0.9085	-2.79	16.89
SF Tolt River	2·P	0.0931	0.9688	0.9237	-2.32	16.04
	No DA	0.2423	0.7595	0.467	81.64	176.98
	P	0.1779	0.8992	0.7129	109.77	123.95
	1/2·P	0.1908	0.8796	0.6696	108.37	134.16
SF Payette River	2·P	0.1699	0.9121	0.738	112.67	116.76
	No DA	0.1238	0.9629	0.8947	-26.77	29.43
	P	0.1104	0.9705	0.9162	-24.77	27.02
	1/2·P	0.1105	0.9712	0.9162	-24.79	26.64
Smith River	2·P	0.1151	0.9667	0.909	-25.38	28.23
	No DA	0.211	0.8715	0.7223	-28.5	76.42
	P	0.1686	0.9183	0.8227	-34.18	62.37
	1/2·P	0.1769	0.9099	0.8048	-33.18	66.06
General Creek	2·P	0.1609	0.926	0.8384	-34.93	59.28
	No DA	0.1178	0.9782	0.9523	-15.54	36.64
	P	0.0803	0.9925	0.9778	-19.42	25.94
	1/2·P	0.0854	0.991	0.9749	-19.03	26.97
Blackwood Creek	2·P	0.0796	0.9924	0.9782	-19.22	26.53
	No DA	0.1274	0.9764	0.9346	-52.44	55.12
	P	0.1136	0.9857	0.948	-59.09	51.02
	1/2·P	0.1135	0.9856	0.9481	-58.08	49.74
Merced River	2·P	0.1157	0.9848	0.9461	-59.65	52.3
	No DA	0.266	0.952	0.7369	-105.4	83.41
	P	0.2418	0.9627	0.7827	-101.68	81.79
	1/2·P	0.2477	0.9607	0.7719	-103.04	84.19
	2·P	0.2364	0.9642	0.7922	-100.34	78.37

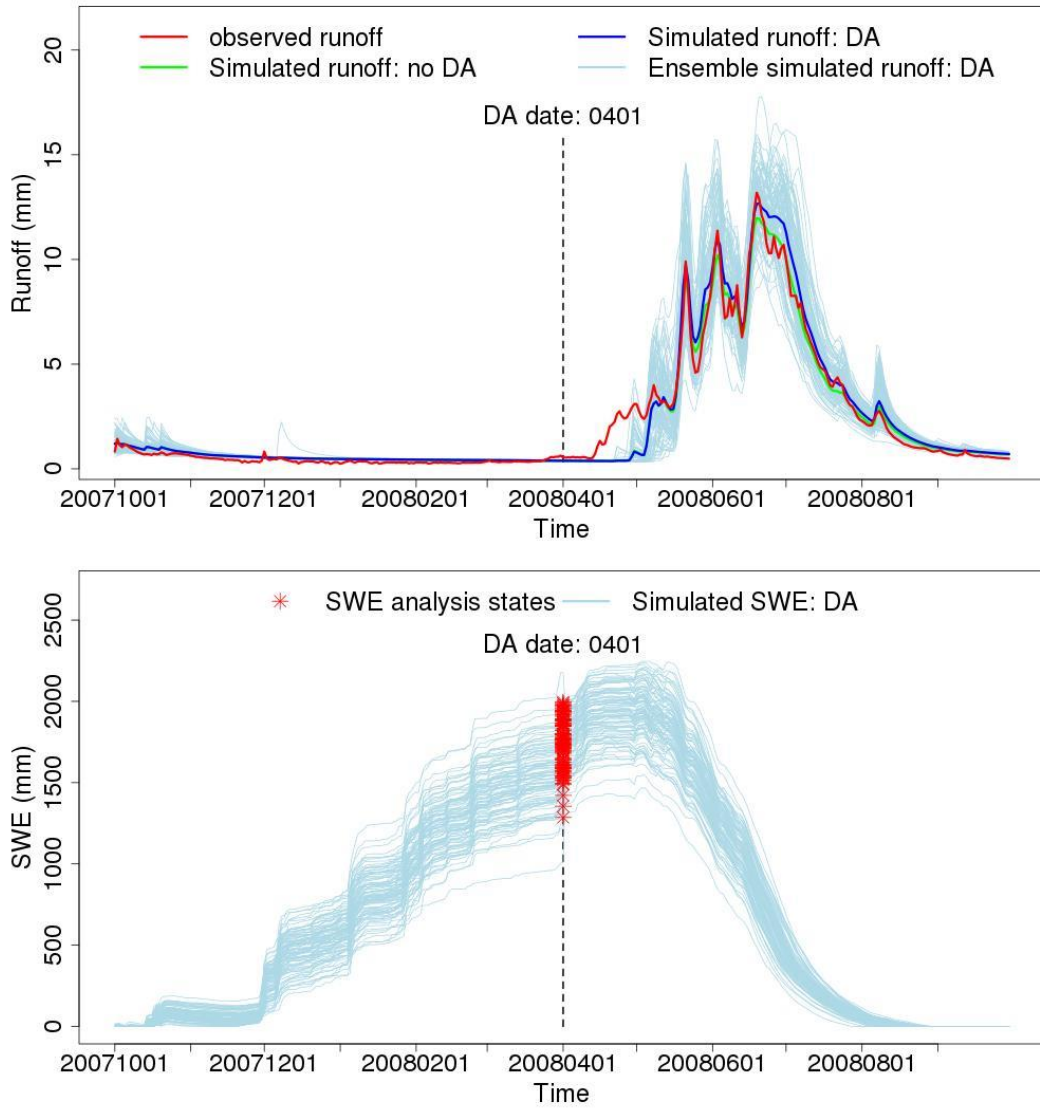
4 **Table S1.3** Evaluation statistics for percentile interpolation before and after DA for the 1-year window.

Basin name	Forecast error variance (P)	R-RMSE	R	NSE	Bias	CRPS
Crystal River	No DA	0.1237	0.9312	0.8316	-16.64	34.92
	P	0.1182	0.9411	0.8462	-11.18	33.14
	1/2·P	0.1203	0.9385	0.8408	-13.55	33.61
	2·P	0.1146	0.9447	0.8555	-7.65	32.51
Vallecito River	No DA	0.1101	0.9708	0.8736	-33.89	29.95
	P	0.1042	0.9731	0.8869	-31.71	28.92
	1/2·P	0.1072	0.9725	0.8801	-33.05	29.49
	2·P	0.0996	0.9727	0.8967	-29.13	28.05
Greys River	No DA	0.1131	0.9522	0.8874	-2.98	18.67
	P	0.0895	0.9764	0.9295	-16.83	17.35
	1/2·P	0.089	0.9725	0.9302	-13.03	16.91
	2·P	0.0941	0.9781	0.9221	-20.37	18.43
SF Tolt River	No DA	0.2423	0.7595	0.467	81.64	176.98
	P	0.2231	0.8425	0.5484	119.61	158.03
	1/2·P	0.2214	0.8291	0.5552	104.1	162.16
	2·P	0.2277	0.8571	0.5293	141.74	152.04
SF Payette River	No DA	0.1238	0.9629	0.8947	-26.77	29.43
	P	0.1125	0.9671	0.913	-22.03	27.09
	1/2·P	0.1162	0.9663	0.9073	-24.15	27.79
	2·P	0.1081	0.9678	0.9197	-18.97	26.53
Smith River	No DA	0.211	0.8715	0.7223	-28.5	76.42
	P	0.1791	0.9049	0.7998	-26.11	67.47
	1/2·P	0.1867	0.8981	0.7824	-29.43	70.29
	2·P	0.1702	0.9123	0.8192	-20.44	63.62
General Creek	No DA	0.1178	0.9782	0.9523	-15.54	36.64
	P	0.099	0.9857	0.9663	-13.95	31.94
	1/2·P	0.1056	0.9833	0.9616	-14.61	33.31
	2·P	0.092	0.9879	0.9709	-12.82	31.1
Blackwood Creek	No DA	0.1274	0.9764	0.9346	-52.44	55.12
	P	0.1184	0.9803	0.9435	-47.1	50.81
	1/2·P	0.1208	0.9794	0.9412	-49.23	51.03
	2·P	0.1167	0.9803	0.9451	-43.85	52.7
Merced River	No DA	0.266	0.952	0.7369	-105.4	83.41
	P	0.2462	0.9618	0.7747	-97.75	80.51
	1/2·P	0.254	0.9596	0.7603	-101.73	83.05
	2·P	0.2361	0.964	0.7929	-92.41	77.25

6 **Table S1.4** Evaluation statistics for Z-score interpolation before and after DA for the 1-year window.

Basin name	Forecast error variance (P)	R-RMSE	R	NSE	Bias	CRPS
Crystal River	No DA	0.1237	0.9312	0.8316	-16.64	34.92
	P	0.1146	0.9373	0.8557	-7.16	32.42
	1/2·P	0.1178	0.9354	0.8475	-10.79	33.2
	2·P	0.1108	0.9397	0.8649	-2.44	31.72
Vallecito River	No DA	0.1101	0.9708	0.8736	-33.89	29.95
	P	0.0942	0.9735	0.9076	-28.14	26.35
	1/2·P	0.0985	0.9739	0.8989	-30.2	27.3
Greys River	2·P	0.0908	0.9715	0.9141	-25.48	25.97
	No DA	0.1131	0.9522	0.8874	-2.98	18.67
	P	0.1057	0.9633	0.9018	-13.61	19.19
	1/2·P	0.1065	0.9601	0.9001	-10.29	18.52
SF Tolt River	2·P	0.1064	0.9661	0.9003	-17.06	20
	No DA	0.2423	0.7595	0.467	81.64	176.98
	P	0.1823	0.8703	0.6984	93.83	128.4
	1/2·P	0.198	0.8422	0.6442	91.31	141.51
SF Payette River	2·P	0.1684	0.8959	0.7426	98.5	116.21
	No DA	0.1238	0.9629	0.8947	-26.77	29.43
	P	0.1135	0.9679	0.9116	-23.47	27.82
	1/2·P	0.1137	0.9682	0.9112	-23.87	27.65
Smith River	2·P	0.1182	0.9645	0.9041	-24.14	28.54
	No DA	0.211	0.8715	0.7223	-28.5	76.42
	P	0.1789	0.9021	0.8003	-26.81	65.62
	1/2·P	0.189	0.8926	0.7772	-28.12	69.32
General Creek	2·P	0.1674	0.9134	0.8252	-24.64	61.26
	No DA	0.1178	0.9782	0.9523	-15.54	36.64
	P	0.0937	0.9897	0.9698	-21.79	30.31
	1/2·P	0.0993	0.9867	0.9661	-19.22	31.93
Blackwood Creek	2·P	0.0911	0.9919	0.9714	-24.93	30.11
	No DA	0.1274	0.9764	0.9346	-52.44	55.12
	P	0.1116	0.9853	0.9498	-54.12	50.38
	1/2·P	0.1151	0.9832	0.9466	-53.3	50.71
Merced River	2·P	0.1108	0.9861	0.9505	-55.18	51.35
	No DA	0.266	0.952	0.7369	-105.4	83.41
	P	0.246	0.9661	0.775	-96.83	79.82
	1/2·P	0.2507	0.9642	0.7664	-99.65	82.59
	2·P	0.2423	0.9669	0.7819	-93.75	77

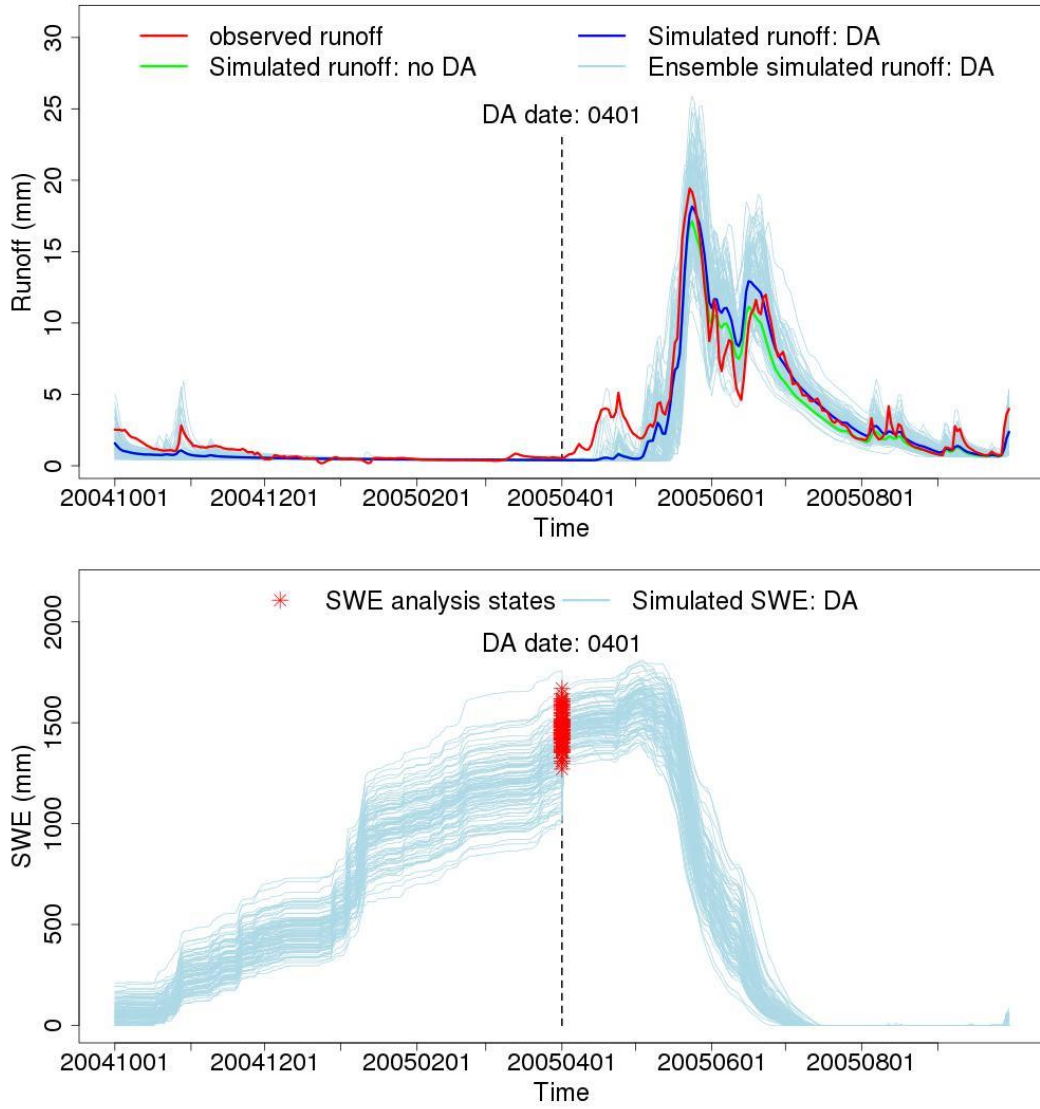
Region: 14 Basin ID: 09081600 Name: Crystal River



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Figure S1.1. Time series plots for runoff and SWE for Crystal River following Figure 7.

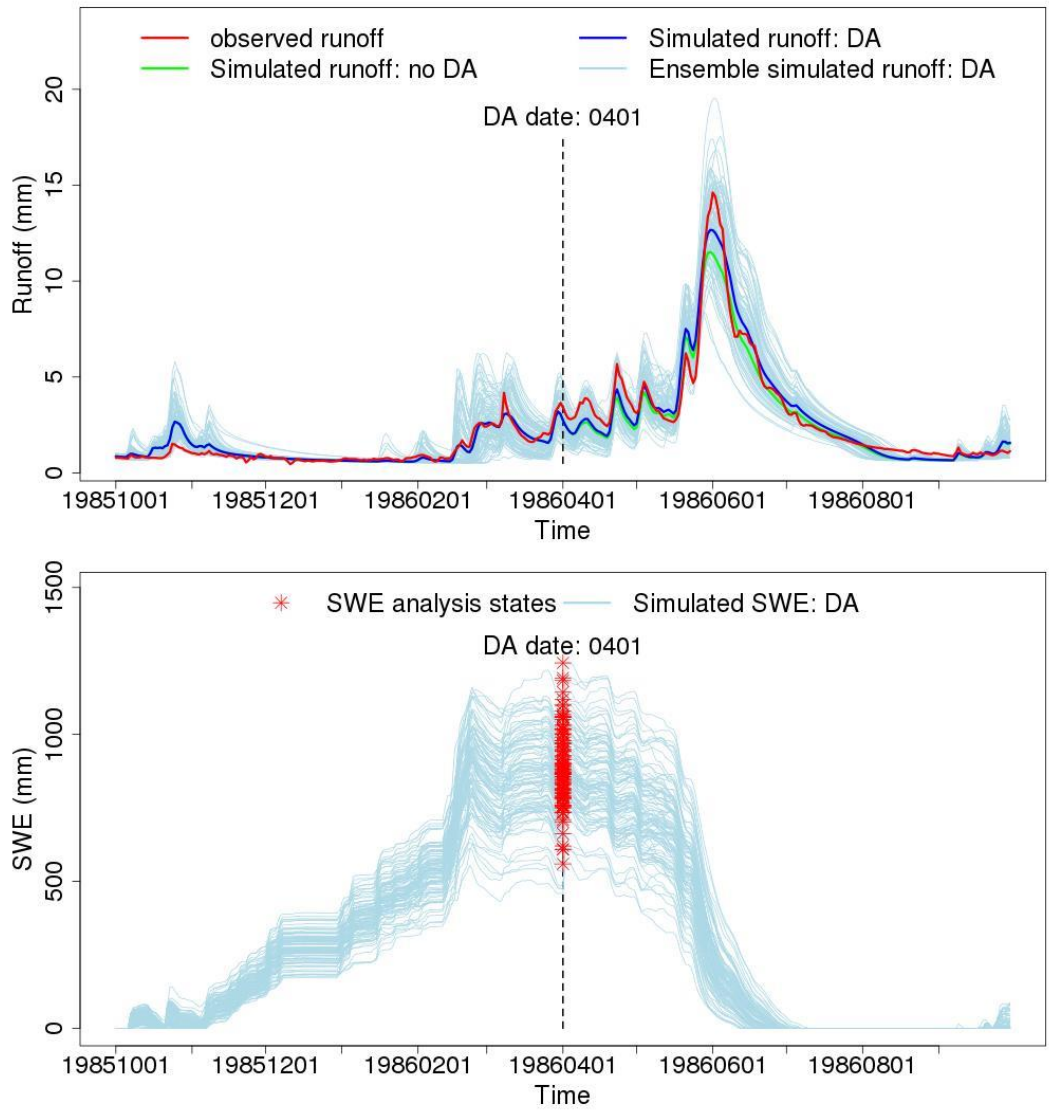
Region: 14 Basin ID: 09352900 Name: Vallecito Creek



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Figure S1.2. Time series plots for runoff and SWE for Vallecito Creek following Figure 7.

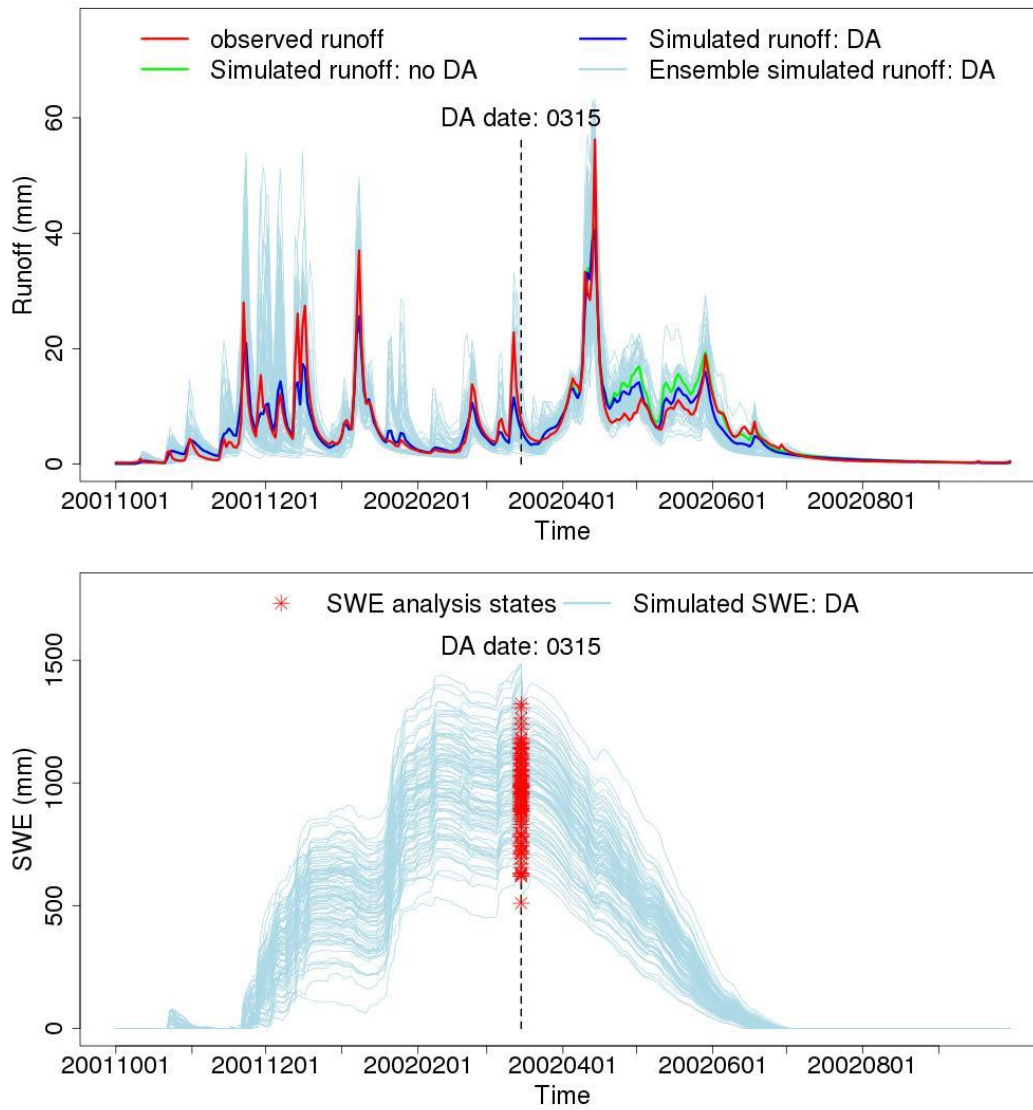
Region: 17 Basin ID: 13235000 Name: SF Payette River



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Figure S1.3. Time series plots for runoff and SWE for SF Payette River following Figure 7.

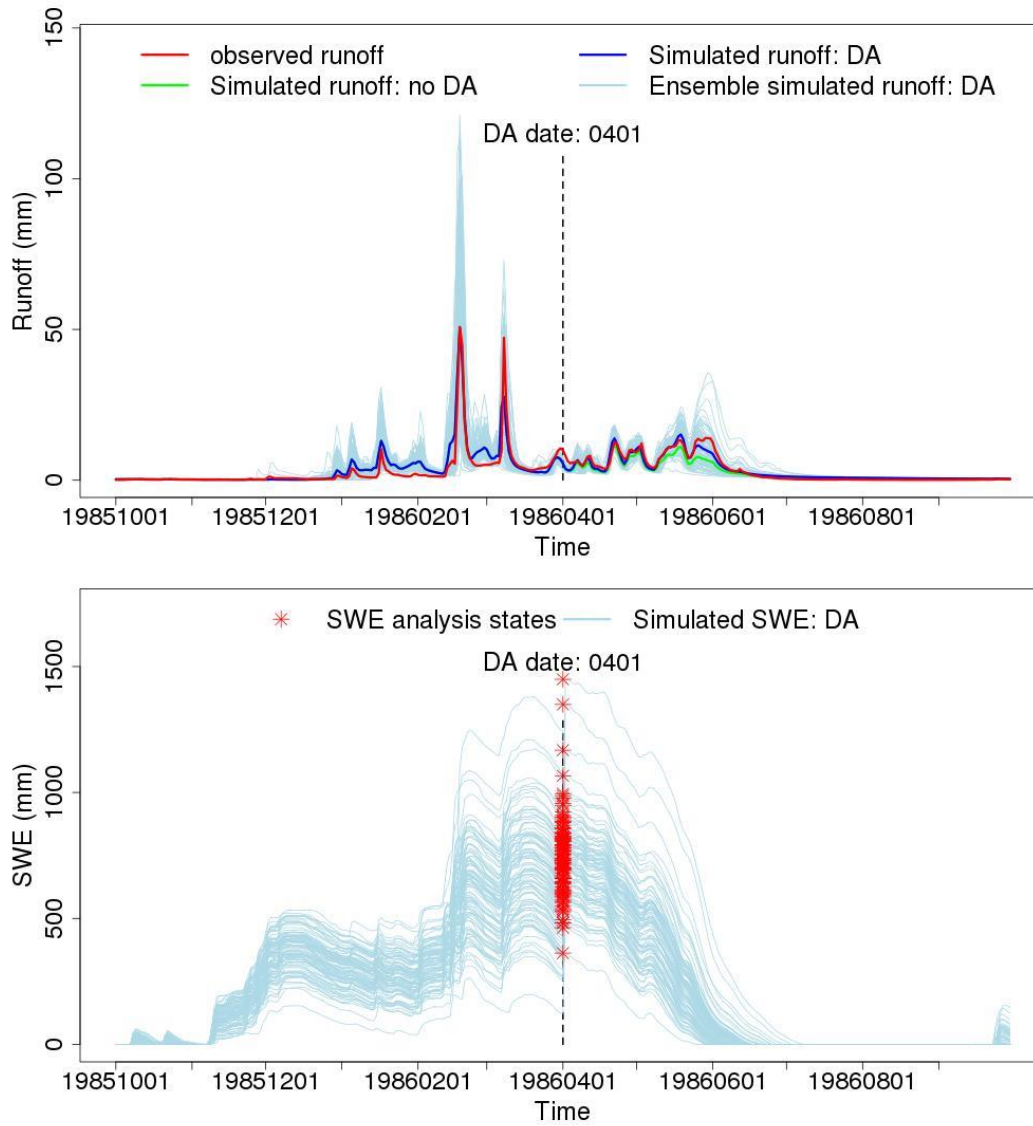
Region: 17 Basin ID: 14158790 Name: Smith River



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Figure S1.4. Time series plots for runoff and SWE for Smith River following Figure 7.

Region: 16 Basin ID: 10336645 Name: General Creek

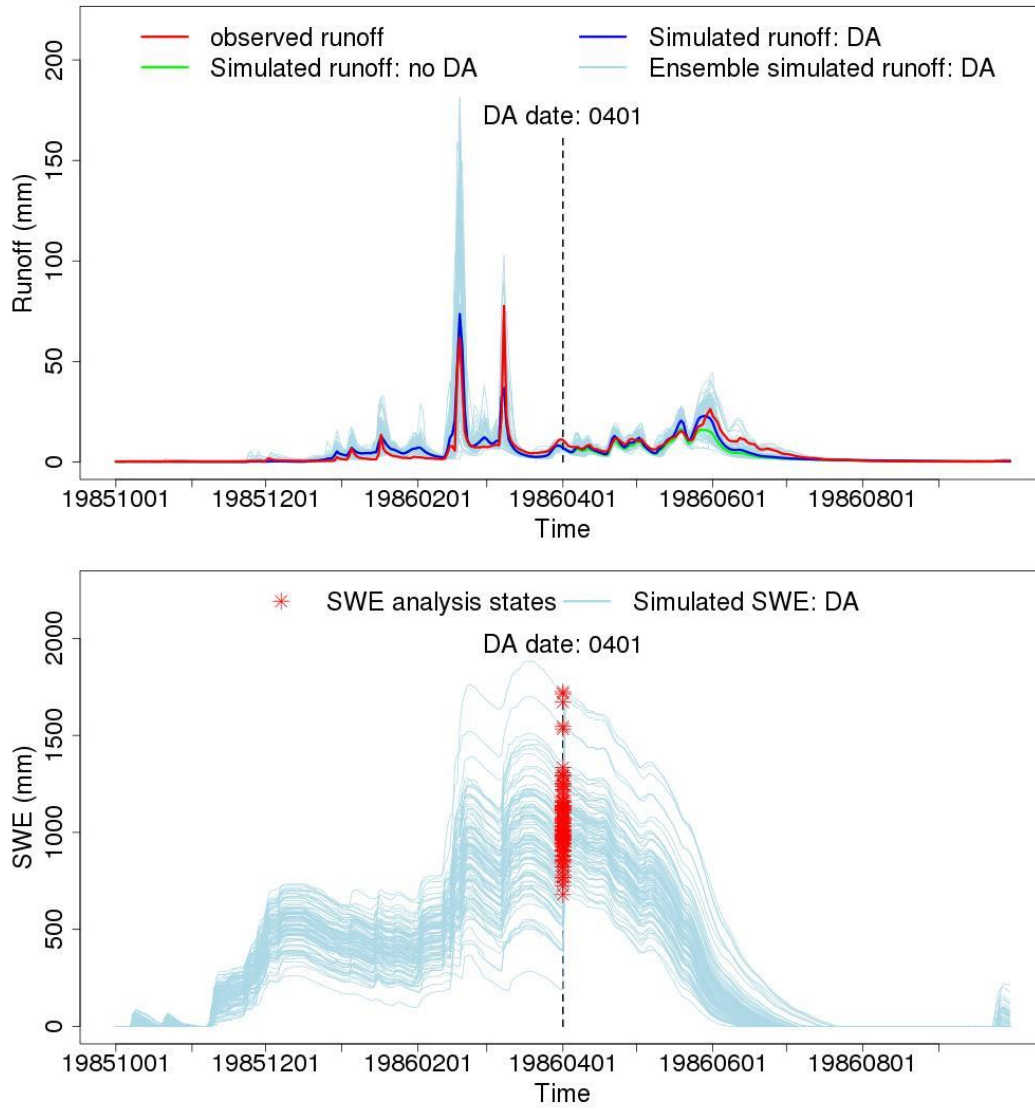


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23 Figure S1.5. Time series plots for runoff and SWE for General Creek following Figure 7.

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Region: 16 Basin ID: 10336660 Name: Blackwood Creek



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Figure S1.6. Time series plots for runoff and SWE for Blackwood Creek following Figure 7.