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Table S 1. Listing of the 32 GCMs and Emission Scenarios available in the CMIP5, LOCA Archive

Model Short Name	Organization	Emissions Scenarios
access1-0	Commonwealth Scientific and Industrial Research Organization and Bureau of Meteorology, Australia	RCP4.5, RCP8.5
access1-3	Commonwealth Scientific and Industrial Research Organization and Bureau of Meteorology, Australia	RCP4.5, RCP8.5
bcc-csm1-1	Beijing Climate Center, China Meteorological Administration	RCP4.5, RCP8.5
bcc-csm1-1-m	Beijing Climate Center, China Meteorological Administration	RCP4.5, RCP8.5
canesm2	Canadian Centre for Climate Modelling and Analysis	RCP4.5, RCP8.5
ccsm4	National Center for Atmospheric Research	RCP4.5, RCP8.5
cesm1-bgc	Community Earth System Model Contributors	RCP4.5, RCP8.5
cesm1-cam5	Community Earth System Model Contributors	RCP4.5, RCP8.5
cmcc-cm	Centro Euro-Mediterraneo per I Cambiamenti Climatici	RCP4.5, RCP8.5
cnrm-cm5	Centre National de Recherches Météorologiques/ Centre Européen de Recherche et Formation Avancée en Calcul Scientifique	RCP4.5, RCP8.5
csiro-mk3-6-0	Commonwealth Scientific and Industrial Research Organization, Queensland Climate Change Centre of Excellence	RCP4.5, RCP8.5
ec-earth	EC-Earth consortium, representing 22 academic institutions and meteorological services from 10 countries in Europe	RCP4.5, RCP8.5
fgoals-g2	Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics, Institute of Atmospheric Physics, Chinese Academy of Sciences, and Center for Earth System Science, Tsinghua University	RCP4.5, RCP8.5
gfdl-cm3	NOAA Geophysical Fluid Dynamics Laboratory	RCP4.5, RCP8.5
gfdl-esm2g	NOAA Geophysical Fluid Dynamics Laboratory	RCP4.5, RCP8.5
gfdl-esm2m	NOAA Geophysical Fluid Dynamics Laboratory	RCP4.5, RCP8.5
giss-e2-r	NASA Goddard Institute for Space Studies	RCP4.5, RCP8.5
hadgem2-ao	Met Office Hadley Centre (additional HadGEM2ES realizations contributed by Instituto Nacional de Pesquisas Espaciais)	RCP4.5, RCP8.5
hadgem2-cc	Met Office Hadley Centre (additional HadGEM2ES realizations contributed by Instituto Nacional de Pesquisas Espaciais)	RCP4.5, RCP8.5
hadgem2-es	Met Office Hadley Centre (additional HadGEM2ES realizations contributed by Instituto Nacional de Pesquisas Espaciais)	RCP4.5, RCP8.5
inmcm4	Institute for Numerical Mathematics	RCP4.5, RCP8.5
ipsl-cm5a-lr	Institut Pierre-Simon Laplace	RCP4.5, RCP8.5
ipsl-cm5a-mr	Institut Pierre-Simon Laplace	RCP4.5, RCP8.5

Model Short Name	Organization	Emissions Scenarios
miroc-esm	Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute (The University of Tokyo), and National Institute for Environmental Studies	RCP4.5, RCP8.5
miroc-esm-chem	Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute (The University of Tokyo), and National Institute for Environmental Studies	RCP4.5, RCP8.5
miroc5	Atmosphere and Ocean Research Institute (The University of Tokyo), National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology	RCP4.5, RCP8.5
mpi-esm-lr	Max-Planck-Institut für Meteorologie (Max Planck Institute for Meteorology)	RCP4.5, RCP8.5
mpi-esm-mr	Max-Planck-Institut für Meteorologie (Max Planck Institute for Meteorology)	RCP4.5, RCP8.5
mri-cgcm3	Meteorological Research Institute	RCP4.5, RCP8.5
noresm1-m	Norwegian Climate Centre	RCP4.5, RCP8.5
cmcc-cms	Centro Euro-Mediterraneo per I Cambiamenti Climatici	RCP4.5, RCP8.5
giss-e2-h	NASA Goddard Institute for Space Studies	RCP4.5, RCP8.5

Table S 2. Summary of Temperature Trends

Climate Normals	Comparison	Reference	State	Weather Parameter	Average Difference (°C)
Data Interval 1981 – 2010	'LOCA Archive' 1981 – 2010	PRISM 1981 – 2010	Wet	Daily Max.	1.3
				Daily Min.	1.1
			Dry	Daily Max.	0.3
				Daily Min.	-0.3
Projection Interval 1 2011 – 2040	'LOCA Archive' 2011 – 2040	'LOCA Archive' 1981 – 2010	Wet	Daily Max.	1.1
				Daily Min.	1.0
			Dry	Daily Max.	1.2
				Daily Min.	1.1
Projection Interval 2 2041 - 2070	'LOCA Archive' 2041 – 2070	'LOCA Archive' 2011 – 2040	Wet	Daily Max.	1.1
				Daily Min.	1.1
			Dry	Daily Max.	1.2
				Daily Min.	1.2
Projection Interval 3 2071 - 2100	'LOCA Archive' 2071 – 2099	'LOCA Archive' 2041 – 2070	Wet	Daily Max.	1.0
				Daily Min.	0.9
			Dry	Daily Max.	1.2
				Daily Min.	1.1

Table S 3. Negative Binomial Dry Spell Distributions, Best Fit Parameters and Mean Values

Month	PRISM (1981-2010)			LOCA Archive (2011-2040)			LOCA Archive (2041-2070)			LOCA Archive (2071-2100)		
	P	N	Sample Mean $\approx$ Distribution Mean	P	N	Sample Mean $\approx$ Distribution Mean	P	N	Sample Mean $\approx$ Distribution Mean	P	N	Sample Mean $\approx$ Distribution Mean
1	0.1377	1.3836	8.6673	0.1445	1.4152	8.3818	0.1376	1.3924	8.7247	0.1361	1.3979	8.8699
2	0.1493	1.4472	8.2482	0.1760	1.5295	7.1623	0.1664	1.4934	7.4796	0.1487	1.3806	7.9008
3	0.1757	1.7447	8.1873	0.1849	1.6225	7.1512	0.1668	1.5444	7.7167	0.1685	1.5579	7.6874
4	0.2020	1.9525	7.7142	0.2710	1.9785	5.3225	0.2545	1.8612	5.4532	0.2462	1.8329	5.6105
5	0.2151	1.6819	6.1385	0.3133	1.9848	4.3504	0.2834	1.8174	4.5964	0.2627	1.6999	4.7711
6	0.1412	1.1477	6.9808	0.1725	1.2248	5.8768	0.1632	1.1878	6.0887	0.1536	1.1548	6.3637
7	0.1160	1.1810	9.0042	0.1531	1.2932	7.1516	0.1443	1.2317	7.3024	0.1381	1.2235	7.6354
8	0.1919	1.6122	6.7871	0.1899	1.5227	6.4940	0.1841	1.4928	6.6135	0.1719	1.4555	7.0108
9	0.1551	1.4022	7.6409	0.2345	1.6232	5.2984	0.2204	1.5311	5.4173	0.2081	1.4669	5.5826
10	0.0910	0.9833	9.8248	0.1783	1.4339	6.6061	0.1644	1.3466	6.8422	0.1517	1.2958	7.2484
11	0.1026	1.2676	11.0900	0.1614	1.3648	7.0918	0.1511	1.2957	7.2782	0.1417	1.2527	7.5885
12	0.0873	1.0784	11.2738	0.1383	1.3093	8.1566	0.1340	1.2908	8.3445	0.1261	1.2548	8.6965

Table S 4. Negative Binomial Wet Spell Distributions, Best Fit Parameters and Mean Values

Month	PRISM (1981-2010)			LOCA Archive (2011-2040)			LOCA Archive (2041-2070)			LOCA Archive (2071-2100)		
	P	N	Sample Mean $\approx$ Distribution Mean	P	N	Sample Mean $\approx$ Distribution Mean	P	N	Sample Mean $\approx$ Distribution Mean	P	N	Sample Mean $\approx$ Distribution Mean
1	0.6511	3.4834	1.8663	0.7739	6.1790	1.8055	0.7488	5.3188	1.7846	0.7560	5.5364	1.7867
2	0.6448	3.2969	1.8159	0.8482	10.9379	1.9578	0.8206	8.8536	1.9354	0.8163	8.5297	1.9197
3	0.6379	3.1039	1.7620	0.8751	13.3915	1.9116	0.8529	10.9285	1.8853	0.8108	7.9895	1.8638
4	0.6388	3.1279	1.7687	0.8603	13.8855	2.2539	0.8307	11.1712	2.2771	0.8485	12.6242	2.2535
5	0.6505	3.4677	1.8627	0.6529	5.0099	2.6637	0.6582	5.1273	2.6630	0.6733	5.3872	2.6141
6	0.6745	4.2927	2.0720	0.5694	3.9046	2.9522	0.5717	3.9461	2.9567	0.5491	3.5766	2.9370
7	0.6729	4.2301	2.0567	0.6184	4.2645	2.6319	0.6150	4.1920	2.6248	0.5980	3.8932	2.6174
8	0.6772	4.4034	2.0986	0.6437	4.6540	2.5764	0.6225	4.2708	2.5904	0.5936	3.7992	2.6013
9	0.6507	3.4718	1.8634	0.5841	4.0781	2.9042	0.5838	4.0917	2.9173	0.5495	3.6441	2.9877
10	0.6236	3.5963	2.1703	0.7927	9.5024	2.4845	0.7878	9.1591	2.4669	0.7840	8.9667	2.4700
11	0.6653	3.9515	1.9880	0.8634	13.3915	2.1183	0.8379	10.9285	2.1139	0.8026	8.5297	2.0982
12	0.6458	3.3244	1.8232	0.8294	9.0486	1.8619	0.8142	8.0995	1.8486	0.8121	7.9325	1.8359

Table S 5. Mixed Exponential Distributions, ‘LOCA Archive’ Wet Day Precipitation Depth, Best Fit Parameters and Central Tendency Statistics

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean
1	62	0.802	2.169	13.175	2.000	4.352	0.802	2.167	13.313	2.000	4.379	0.826	2.189	14.905	2.000	4.408
2	62	0.747	2.286	16.670	2.000	5.923	0.777	2.328	18.135	2.000	5.851	0.774	2.289	18.015	2.000	5.840
3	62	0.748	2.252	14.562	2.000	5.350	0.756	2.315	15.807	2.000	5.604	0.757	2.243	14.807	2.000	5.300
4	62	0.706	2.954	17.139	3.000	7.131	0.684	2.973	17.343	3.000	7.512	0.699	2.955	17.351	3.000	7.283
5	62	0.735	3.613	21.389	3.000	8.324	0.742	3.635	22.192	3.000	8.429	0.736	3.568	21.944	3.000	8.423
6	62	0.788	4.379	28.513	4.000	9.486	0.789	4.372	27.925	4.000	9.351	0.802	4.588	32.795	4.000	10.162
7	62	0.786	3.606	30.160	3.000	9.284	0.773	3.598	31.819	3.000	10.008	0.773	3.506	32.089	3.000	9.993
8	62	0.794	3.713	28.313	3.000	8.781	0.793	3.805	29.859	3.000	9.191	0.786	3.849	31.617	3.121	9.793
9	62	0.741	3.937	32.275	3.815	11.274	0.745	3.969	33.998	3.868	11.628	0.739	4.096	34.085	4.000	11.933
10	62	0.747	3.427	24.753	3.000	8.812	0.745	3.399	25.613	3.000	9.056	0.746	3.408	27.174	3.000	9.447
11	62	0.806	2.885	15.426	2.197	5.322	0.798	2.875	16.404	2.237	5.603	0.802	2.826	16.993	2.000	5.628
12	62	0.828	2.249	13.615	2.000	4.203	0.826	2.281	15.267	2.000	4.536	0.830	2.236	14.405	2.000	4.300
1	63	0.798	2.112	13.323	2.000	4.375	0.798	2.121	13.266	2.000	4.374	0.821	2.146	14.914	2.000	4.426
2	63	0.743	2.261	16.633	2.000	5.950	0.774	2.307	18.085	2.000	5.872	0.771	2.269	17.960	2.000	5.858
3	63	0.738	2.232	14.576	2.000	5.463	0.748	2.284	15.728	2.000	5.673	0.750	2.221	14.931	2.000	5.397
4	63	0.701	3.029	17.506	3.000	7.359	0.683	3.017	17.741	3.000	7.686	0.697	3.001	17.721	3.000	7.467
5	63	0.749	3.812	22.171	3.242	8.416	0.754	3.787	22.864	3.154	8.485	0.745	3.671	22.449	3.024	8.453
6	63	0.797	4.383	28.756	4.000	9.321	0.797	4.345	28.272	3.965	9.200	0.811	4.579	32.829	4.000	9.932
7	63	0.802	3.649	30.269	3.000	8.923	0.793	3.706	32.047	3.000	9.575	0.795	3.660	32.836	3.000	9.627
8	63	0.795	3.885	28.420	3.035	8.919	0.797	4.029								

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean
3	64	0.730	2.188	15.050	2.000	5.658	0.735	2.254	15.935	2.000	5.874	0.746	2.197	15.441	2.000	5.559
4	64	0.690	2.944	17.492	3.000	7.460	0.668	2.917	17.691	3.000	7.824	0.682	2.904	17.657	3.000	7.594
5	64	0.744	3.675	21.928	3.173	8.346	0.750	3.697	22.730	3.115	8.446	0.745	3.580	22.380	3.034	8.377
6	64	0.803	4.261	29.734	3.720	9.274	0.806	4.232	29.347	3.614	9.092	0.810	4.357	32.823	3.736	9.766
7	64	0.806	3.724	31.741	3.000	9.161	0.806	3.864	34.425	3.000	9.794	0.808	3.816	35.365	3.000	9.876
8	64	0.789	3.938	28.445	3.117	9.116	0.792	4.090	30.677	3.310	9.614	0.786	4.068	32.101	3.411	10.081
9	64	0.761	4.168	32.283	3.834	10.878	0.761	4.191	33.612	3.949	11.212	0.759	4.280	34.345	4.000	11.540
10	64	0.765	3.630	25.649	3.000	8.804	0.758	3.587	26.438	3.000	9.111	0.761	3.603	28.823	3.000	9.627
11	64	0.803	2.935	15.853	2.268	5.485	0.798	2.935	17.233	2.314	5.818	0.806	2.899	17.763	2.177	5.777
12	64	0.843	2.342	14.624	2.000	4.273	0.844	2.392	16.663	2.000	4.625	0.843	2.304	15.447	2.000	4.364
1	76	0.794	2.175	13.377	2.000	4.479	0.797	2.176	13.361	2.000	4.449	0.819	2.194	15.064	2.000	4.519
2	76	0.742	2.296	17.186	2.000	6.136	0.771	2.334	18.681	2.000	6.084	0.769	2.322	18.667	2.000	6.094
3	76	0.748	2.231	14.741	2.000	5.390	0.751	2.252	15.934	2.000	5.653	0.756	2.200	14.965	2.000	5.316
4	76	0.713	2.933	17.448	2.945	7.106	0.690	2.919	17.604	3.000	7.466	0.707	2.939	17.590	3.000	7.230
5	76	0.745	3.680	21.915	3.075	8.334	0.749	3.662	22.516	3.000	8.400	0.743	3.589	22.273	3.000	8.388
6	76	0.796	4.307	28.161	3.931	9.163	0.796	4.287	27.675	3.876	9.058	0.809	4.518	32.341	4.000	9.825
7	76	0.789	3.732	30.073	3.000	9.288	0.779	3.779	31.749	3.000	9.967	0.778	3.688	32.017	3.000	9.986
8	76	0.801	3.742	28.431	3.000	8.659	0.799	3.816	29.360	3.045	8.950	0.793	3.824	31.273	3.118	9.511
9	76	0.747	4.022	32.491	3.783	11.219	0.748	4.030	34.002	3.853	11.579	0.741	4.145	34.033	4.000	11.877
10	76	0.736	3.489	24.784	3.045	9.104	0.740	3.441	25.788	3.000	9.260	0.737	3			

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean
8	77	0.798	3.848	28.337	3.016	8.787	0.798	3.941	29.639	3.175	9.132	0.792	3.921	31.272	3.232	9.622
9	77	0.756	4.169	32.474	3.893	11.069	0.755	4.161	33.735	3.964	11.397	0.751	4.285	34.258	4.000	11.741
10	77	0.742	3.643	24.909	3.179	9.124	0.745	3.589	25.873	3.082	9.280	0.742	3.587	27.535	3.058	9.770
11	77	0.799	2.932	15.698	2.317	5.498	0.793	2.902	16.813	2.305	5.785	0.798	2.862	17.213	2.122	5.762
12	77	0.831	2.296	14.124	2.000	4.297	0.829	2.319	15.757	2.000	4.621	0.831	2.265	14.756	2.000	4.375
1	78	0.797	2.072	13.536	2.000	4.404	0.800	2.068	13.537	2.000	4.365	0.823	2.108	15.127	2.000	4.409
2	78	0.743	2.250	17.377	2.000	6.139	0.765	2.269	18.533	2.000	6.092	0.761	2.232	18.308	2.000	6.079
3	78	0.726	2.217	14.712	2.000	5.639	0.728	2.249	15.638	2.000	5.885	0.740	2.210	15.051	2.000	5.553
4	78	0.689	3.009	17.433	3.000	7.502	0.668	3.003	17.671	3.000	7.866	0.685	2.988	17.606	3.000	7.594
5	78	0.748	3.849	22.163	3.335	8.458	0.750	3.805	22.601	3.214	8.499	0.744	3.697	22.315	3.135	8.463
6	78	0.799	4.253	28.232	3.789	9.071	0.800	4.198	27.793	3.681	8.926	0.808	4.408	31.595	3.855	9.622
7	78	0.800	3.700	30.440	3.000	9.055	0.789	3.742	31.929	3.000	9.681	0.795	3.738	33.261	3.000	9.804
8	78	0.789	3.906	28.176	3.053	9.033	0.791	4.014	29.888	3.222	9.423	0.783	3.984	31.130	3.316	9.870
9	78	0.760	4.265	32.486	3.999	11.051	0.758	4.246	33.592	4.000	11.355	0.758	4.395	34.655	4.000	11.728
10	78	0.750	3.758	25.570	3.242	9.204	0.748	3.688	26.439	3.165	9.411	0.748	3.689	28.599	3.167	9.957
11	78	0.794	2.977	16.021	2.405	5.659	0.789	2.976	17.349	2.454	6.004	0.795	2.919	17.693	2.267	5.941
12	78	0.831	2.322	14.668	2.000	4.404	0.832	2.362	16.504	2.000	4.744	0.833	2.300	15.372	2.000	4.489
1	79	0.801	2.146	13.816	2.000	4.469	0.803	2.156	13.859	2.000	4.457	0.831	2.201	15.592	2.000	4.460
2	79	0.731	2.318	17.806	2.000	6.488	0.753	2.355	18.889	2.000	6.433	0.747	2.310	18.733	2.000	6.458
3	79	0.704	2.226	15.209	2.000	6.063	0.709	2.268	15.934	2.000	6.248	0.72				

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean
1	90	0.796	2.155	13.361	2.000	4.441	0.800	2.143	13.312	2.000	4.377	0.824	2.179	15.124	2.000	4.462
2	90	0.743	2.276	17.304	2.000	6.130	0.769	2.324	18.720	2.000	6.111	0.767	2.293	18.641	2.000	6.099
3	90	0.747	2.239	14.663	2.000	5.385	0.746	2.261	15.699	2.000	5.673	0.753	2.194	14.769	2.000	5.306
4	90	0.715	2.962	17.421	2.998	7.086	0.692	2.947	17.601	3.000	7.459	0.709	2.962	17.504	3.000	7.190
5	90	0.748	3.729	21.908	3.098	8.302	0.749	3.707	22.414	3.049	8.397	0.743	3.626	22.117	3.000	8.371
6	90	0.797	4.214	27.426	3.754	8.920	0.794	4.154	26.695	3.727	8.801	0.808	4.398	31.144	3.902	9.538
7	90	0.784	3.729	29.623	3.000	9.333	0.777	3.858	31.494	3.033	10.008	0.775	3.715	31.574	3.000	9.990
8	90	0.800	3.797	28.322	3.039	8.712	0.798	3.864	29.103	3.122	8.955	0.794	3.886	31.144	3.205	9.496
9	90	0.749	4.086	32.528	3.841	11.235	0.748	4.070	33.785	3.909	11.550	0.743	4.206	34.243	4.000	11.914
10	90	0.730	3.488	24.615	3.067	9.193	0.736	3.476	25.759	3.018	9.348	0.733	3.479	26.969	3.029	9.756
11	90	0.796	2.879	15.767	2.330	5.513	0.787	2.842	16.730	2.285	5.805	0.793	2.817	17.118	2.122	5.781
12	90	0.828	2.296	14.131	2.000	4.331	0.821	2.317	15.576	2.000	4.688	0.825	2.253	14.799	2.000	4.445
1	91	0.801	2.170	13.267	2.000	4.377	0.808	2.183	13.334	2.000	4.328	0.829	2.205	15.065	2.000	4.401
2	91	0.742	2.366	17.335	2.000	6.232	0.768	2.392	18.640	2.000	6.158	0.764	2.357	18.468	2.000	6.157
3	91	0.742	2.294	14.716	2.000	5.505	0.743	2.334	15.700	2.000	5.766	0.750	2.265	14.881	2.000	5.415
4	91	0.710	3.036	17.401	3.000	7.201	0.689	3.004	17.633	3.000	7.554	0.708	3.004	17.561	3.000	7.251
5	91	0.748	3.795	21.802	3.200	8.330	0.746	3.744	22.142	3.138	8.422	0.745	3.700	21.966	3.084	8.360
6	91	0.804	4.273	27.787	3.743	8.873	0.802	4.216	27.093	3.738	8.752	0.814	4.447	31.447	3.900	9.463
7	91	0.792	3.808	29.962	3.000	9.238	0.784	3.888	31.460	3.000	9.846	0.784	3.820	32.303	3.000	9.972
8	91	0.799	3.883	28.360	3.059	8.813	0.797	3.941	29.653	3.121	9.172	0.791	3.929	31.067</		

Month	Grid Index	Projection Period 1: 2011-2040						Projection Period 2: 2041-2070						Projection Period 3: 2071-2100					
		Parameters			Statistics			Parameters			Statistics			Parameters			Statistics		
		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	
6	92	0.802	4.326	27.924	3.805	9.010		0.805	4.285	27.570	3.672	8.836		0.811	4.499	30.947	3.959	9.495	
7	92	0.799	3.815	30.061	3.000	9.099		0.789	3.863	31.516	3.000	9.687		0.791	3.797	32.435	3.000	9.784	
8	92	0.795	3.938	28.384	3.080	8.944		0.794	4.018	29.924	3.185	9.346		0.790	4.031	31.431	3.307	9.774	
9	92	0.771	4.376	33.479	4.000	11.046		0.768	4.367	34.190	4.000	11.292		0.767	4.476	35.482	4.000	11.705	
10	92	0.758	3.806	25.478	3.265	9.053		0.755	3.723	26.414	3.183	9.293		0.757	3.761	28.556	3.225	9.793	
11	92	0.799	3.022	15.999	2.473	5.635		0.789	2.977	17.017	2.452	5.941		0.797	2.931	17.554	2.254	5.895	
12	92	0.838	2.406	14.801	2.000	4.417		0.833	2.403	16.339	2.000	4.734		0.832	2.359	15.187	2.000	4.516	
1	93	0.797	2.170	13.589	2.000	4.491		0.800	2.179	13.622	2.000	4.468		0.828	2.216	15.324	2.000	4.475	
2	93	0.727	2.376	17.592	2.000	6.532		0.752	2.422	18.725	2.000	6.473		0.741	2.352	18.387	2.000	6.508	
3	93	0.714	2.296	14.940	2.000	5.913		0.714	2.311	15.586	2.000	6.109		0.727	2.268	15.145	2.000	5.781	
4	93	0.674	3.037	17.238	3.000	7.660		0.658	3.031	17.547	3.000	7.996		0.673	2.949	17.389	3.000	7.674	
5	93	0.750	3.919	22.115	3.373	8.471		0.745	3.878	22.112	3.342	8.532		0.745	3.785	22.168	3.255	8.480	
6	93	0.796	4.339	27.942	3.830	9.153		0.805	4.343	28.188	3.704	9.004		0.807	4.509	31.040	3.922	9.624	
7	93	0.798	3.875	30.860	3.000	9.313		0.790	3.916	32.342	3.000	9.883		0.797	3.918	33.994	3.000	10.009	
8	93	0.789	4.001	28.616	3.187	9.189		0.789	4.043	30.258	3.212	9.576		0.785	4.053	31.740	3.362	10.000	
9	93	0.775	4.453	33.613	4.000	11.020		0.771	4.446	34.240	4.000	11.276		0.772	4.561	35.926	4.000	11.720	
10	93	0.763	3.891	25.979	3.275	9.123		0.759	3.793	26.852	3.205	9.348		0.765	3.858	29.425	3.285	9.871	
11	93	0.795	3.043	16.053	2.570	5.715		0.788	3.001	17.334	2.535	6.033		0.797	2.985	17.820	2.396	5.996	
12	93	0.834	2.422																

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean
11	94	0.790	3.068	16.174	2.632	5.821	0.787	3.041	17.736	2.587	6.176	0.795	3.019	18.204	2.462	6.125
12	94	0.830	2.452	15.354	2.000	4.648	0.831	2.498	17.372	2.000	5.006	0.832	2.451	16.032	2.000	4.731
1	104	0.803	2.210	13.100	2.000	4.361	0.809	2.212	13.124	2.000	4.300	0.832	2.237	14.971	2.000	4.382
2	104	0.738	2.391	16.991	2.000	6.211	0.769	2.444	18.482	2.000	6.145	0.762	2.392	18.146	2.000	6.138
3	104	0.753	2.347	14.398	2.000	5.328	0.750	2.349	15.290	2.000	5.585	0.755	2.267	14.373	2.000	5.239
4	104	0.731	2.939	17.065	2.799	6.743	0.705	2.893	17.023	3.000	7.064	0.724	2.923	17.075	2.774	6.822
5	104	0.742	3.598	21.109	3.000	8.109	0.740	3.565	21.573	3.000	8.251	0.738	3.497	21.307	3.000	8.164
6	104	0.788	4.212	26.331	3.743	8.897	0.790	4.258	25.999	3.838	8.819	0.803	4.430	30.449	3.971	9.543
7	104	0.787	3.828	29.452	3.000	9.274	0.788	3.954	31.503	3.000	9.793	0.783	3.835	31.617	3.000	9.861
8	104	0.803	3.745	28.279	3.000	8.589	0.799	3.817	29.483	3.000	8.986	0.797	3.855	30.898	3.014	9.355
9	104	0.757	4.129	32.200	3.807	10.955	0.756	4.095	32.960	3.861	11.139	0.752	4.255	33.673	4.000	11.540
10	104	0.738	3.461	23.831	3.000	8.799	0.744	3.450	24.838	3.000	8.925	0.744	3.449	26.283	3.000	9.300
11	104	0.791	2.870	15.332	2.335	5.469	0.781	2.811	16.125	2.267	5.729	0.793	2.814	16.784	2.150	5.705
12	104	0.834	2.333	14.264	2.000	4.316	0.826	2.311	15.450	2.000	4.597	0.829	2.272	14.785	2.000	4.408
1	105	0.801	2.217	13.155	2.000	4.393	0.806	2.223	13.254	2.000	4.360	0.831	2.255	15.011	2.000	4.409
2	105	0.730	2.421	17.203	2.000	6.416	0.756	2.465	18.506	2.000	6.372	0.750	2.423	18.170	2.000	6.365
3	105	0.740	2.377	14.407	2.000	5.501	0.741	2.374	15.326	2.000	5.731	0.744	2.286	14.399	2.000	5.390
4	105	0.715	3.02													

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean
4	106	0.707	3.066	17.009	3.000	7.157	0.685	2.996	17.112	3.000	7.439	0.702	2.968	17.038	3.000	7.167
5	106	0.749	3.785	21.283	3.154	8.177	0.747	3.749	21.704	3.177	8.284	0.743	3.647	21.471	3.014	8.225
6	106	0.791	4.180	25.981	3.591	8.746	0.794	4.175	25.523	3.531	8.566	0.802	4.314	28.889	3.660	9.189
7	106	0.799	3.845	29.409	3.000	8.994	0.790	3.927	30.629	3.000	9.539	0.793	3.899	31.637	3.000	9.642
8	106	0.802	4.039	29.243	3.242	9.030	0.799	4.061	30.370	3.228	9.356	0.793	4.064	31.306	3.380	9.694
9	106	0.767	4.460	33.221	4.000	11.165	0.761	4.435	33.575	4.000	11.401	0.762	4.583	34.877	4.000	11.801
10	106	0.748	3.787	24.773	3.277	9.076	0.746	3.717	25.431	3.208	9.232	0.750	3.733	27.470	3.244	9.658
11	106	0.790	2.956	15.747	2.413	5.640	0.784	2.891	16.684	2.366	5.877	0.791	2.880	17.088	2.236	5.847
12	106	0.831	2.381	14.799	2.000	4.484	0.829	2.365	16.163	2.000	4.730	0.825	2.321	15.074	2.000	4.547
1	107	0.796	2.198	13.525	2.000	4.508	0.801	2.219	13.602	2.000	4.480	0.827	2.243	15.299	2.000	4.506
2	107	0.730	2.458	17.692	2.000	6.574	0.752	2.505	18.735	2.000	6.533	0.742	2.443	18.377	2.000	6.551
3	107	0.726	2.393	14.673	2.000	5.761	0.726	2.405	15.436	2.000	5.969	0.734	2.331	14.747	2.000	5.637
4	107	0.699	3.129	17.341	3.000	7.407	0.684	3.123	17.684	3.000	7.719	0.696	3.022	17.419	3.000	7.401
5	107	0.755	3.909	21.894	3.351	8.315	0.749	3.851	21.918	3.338	8.381	0.747	3.766	21.988	3.196	8.375
6	107	0.785	4.174	26.454	3.693	8.958	0.795	4.220	26.507	3.583	8.778	0.800	4.340	29.436	3.766	9.369
7	107	0.798	3.848	29.928	3.000	9.116	0.785	3.901	30.897	3.000	9.713	0.794	3.914	32.713	3.000	9.839
8	107	0.797	3.968	29.256	3.139	9.097	0.795	3.950	30.364	3.148	9.376	0				

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean
9	108	0.771	4.592	33.730	4.000	11.271	0.764	4.604	34.085	4.000	11.571	0.767	4.737	35.805	4.000	11.981
10	108	0.752	3.854	25.587	3.349	9.247	0.751	3.734	26.381	3.182	9.383	0.754	3.794	28.691	3.331	9.915
11	108	0.785	2.914	16.173	2.368	5.765	0.778	2.866	17.383	2.367	6.092	0.788	2.879	17.830	2.263	6.048
12	108	0.822	2.374	15.337	2.000	4.678	0.824	2.412	16.949	2.000	4.970	0.825	2.367	15.761	2.000	4.716
1	120	0.801	2.240	13.252	2.000	4.435	0.806	2.258	13.326	2.000	4.403	0.832	2.271	15.135	2.000	4.427
2	120	0.731	2.482	17.392	2.000	6.488	0.758	2.529	18.678	2.000	6.433	0.748	2.484	18.218	2.000	6.454
3	120	0.743	2.427	14.430	2.000	5.513	0.743	2.438	15.240	2.000	5.733	0.745	2.351	14.372	2.000	5.420
4	120	0.726	3.077	17.272	3.000	6.967	0.706	3.015	17.416	3.000	7.249	0.717	2.967	17.182	3.000	6.983
5	120	0.754	3.798	21.491	3.174	8.157	0.746	3.721	21.488	3.182	8.231	0.746	3.652	21.567	3.024	8.202
6	120	0.785	4.127	25.638	3.543	8.745	0.792	4.190	25.503	3.554	8.626	0.798	4.286	28.633	3.645	9.208
7	120	0.795	3.899	29.355	3.000	9.126	0.788	3.990	30.643	3.033	9.646	0.791	3.945	31.618	3.000	9.731
8	120	0.800	4.032	29.242	3.265	9.067	0.798	4.048	30.338	3.227	9.351	0.795	4.085	31.460	3.376	9.707
9	120	0.764	4.315	32.406	3.928	10.949	0.762	4.340	33.071	4.000	11.188	0.760	4.459	34.114	4.000	11.574
10	120	0.745	3.602	23.956	3.080	8.802	0.744	3.546	24.630	3.001	8.943	0.750	3.593	26.533	3.025	9.323
11	120	0.784	2.879	15.682	2.345	5.640	0.778	2.830	16.578	2.280	5.878	0.790	2.813	17.035	2.128	5.797
12	120	0.830	2.383	14.846	2.000	4.496	0.824	2.333	15.991	2.000	4.734	0.823	2.304	15.062	2.000	4.558
1	121	0.796	2.230	13.325	2.000	4.496	0.803	2.246	13.476	2.000	4.457	0.82				

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Mean $\approx$ Sample Mean
2	122	0.719	2.486	17.602	2.000	6.731	0.743	2.530	18.681	2.000	6.682	0.733	2.467	18.291	2.000	6.692
3	122	0.728	2.426	14.490	2.000	5.701	0.728	2.440	15.159	2.000	5.900	0.733	2.358	14.497	2.000	5.598
4	122	0.714	3.074	17.388	3.000	7.162	0.697	3.019	17.586	3.000	7.437	0.708	2.974	17.391	3.000	7.177
5	122	0.754	3.837	21.649	3.229	8.228	0.746	3.772	21.592	3.256	8.298	0.745	3.685	21.676	3.141	8.274
6	122	0.776	3.984	25.344	3.375	8.769	0.793	4.126	25.936	3.359	8.637	0.793	4.159	28.433	3.443	9.180
7	122	0.799	3.941	30.258	3.000	9.220	0.783	3.960	30.805	3.089	9.787	0.795	3.979	32.991	3.000	9.920
8	122	0.792	4.155	29.782	3.427	9.479	0.793	4.167	30.956	3.399	9.723	0.789	4.199	31.969	3.557	10.059
9	122	0.770	4.634	33.795	4.000	11.333	0.762	4.644	33.979	4.000	11.627	0.764	4.744	35.445	4.017	11.996
10	122	0.743	3.767	25.000	3.291	9.218	0.744	3.683	25.763	3.193	9.345	0.746	3.715	27.788	3.240	9.821
11	122	0.778	2.839	16.119	2.281	5.784	0.772	2.804	17.213	2.282	6.082	0.784	2.793	17.662	2.128	6.002
12	122	0.819	2.348	15.365	2.000	4.706	0.816	2.361	16.651	2.000	4.993	0.818	2.316	15.651	2.000	4.736
1	123	0.790	2.234	13.553	2.000	4.612	0.800	2.258	13.916	2.000	4.591	0.820	2.279	15.162	2.000	4.596
2	123	0.720	2.509	17.783	2.000	6.783	0.744	2.586	18.906	2.000	6.763	0.733	2.502	18.524	2.000	6.773
3	123	0.729	2.438	14.830	2.000	5.792	0.732	2.449	15.409	2.000	5.918	0.735	2.362	14.786	2.000	5.653
4	123	0.709	3.028	17.753	3.000	7.310	0.692	2.981	17.903	3.000	7.582	0.701	2.971	17.675	3.000	7.370
5	123	0.742	3.702	21.365	3.089	8.262	0.732	3.661	21.229							

Month	Grid Index	Projection Period 1: 2011-2040					Projection Period 2: 2041-2070					Projection Period 3: 2071-2100				
		Parameters			Statistics		Parameters			Statistics		Parameters			Statistics	
		α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean	α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean
7	136	0.819	4.010	29.985	3.000	8.716	0.805	4.038	30.579	3.170	9.217	0.812	3.991	32.206	3.000	9.288
8	136	0.796	4.276	29.626	3.664	9.454	0.798	4.320	30.898	3.673	9.682	0.798	4.389	32.109	3.854	9.984
9	136	0.766	4.578	32.422	4.000	11.098	0.763	4.627	32.782	4.000	11.306	0.766	4.751	34.377	4.111	11.680
10	136	0.746	3.644	24.187	3.157	8.870	0.743	3.617	24.866	3.134	9.081	0.741	3.618	26.311	3.169	9.484
11	136	0.776	2.787	15.957	2.134	5.737	0.773	2.761	17.010	2.104	5.997	0.783	2.774	17.501	2.018	5.970
12	136	0.838	2.430	15.596	2.000	4.567	0.835	2.437	16.852	2.000	4.815	0.835	2.349	16.038	2.000	4.612
1	137	0.808	2.289	13.670	2.000	4.470	0.817	2.318	14.213	2.000	4.493	0.830	2.314	14.972	2.000	4.472
2	137	0.739	2.523	17.994	2.000	6.557	0.762	2.619	19.145	2.000	6.546	0.747	2.521	18.641	2.000	6.597
3	137	0.734	2.444	14.498	2.000	5.648	0.738	2.469	15.212	2.000	5.805	0.738	2.383	14.392	2.000	5.526
4	137	0.720	3.101	17.674	3.000	7.178	0.704	3.080	17.817	3.000	7.441	0.711	3.058	17.508	3.000	7.227
5	137	0.770	4.017	22.178	3.371	8.193	0.758	3.921	21.860	3.413	8.271	0.758	3.861	22.141	3.342	8.289
6	137	0.793	4.047	25.194	3.326	8.429	0.805	4.137	25.707	3.300	8.336	0.804	4.185	28.084	3.387	8.871
7	137	0.815	4.018	30.460	3.015	8.900	0.800	4.037	30.833	3.264	9.402	0.809	3.969	32.670	3.000	9.455
8	137	0.790	4.321	30.025	3.754	9.710	0.794	4.357	31.426	3.725	9.927	0.795	4.444	32.895	3.915	10.274
9	137	0.766	4.802	33.497	4.061	11.512	0.760	4.827	33.558	4.200	11.735	0.766	4.988	35.605	4.431	12.143
10	137	0.738	3.778	24.885	3.356	9.309	0.736	3.744	25.551	3.405	9.495	0.734	3.716	27.034	3.331	9.928
11	137	0.773	2.765	16.332	2.099	5.841	0.768	2.759	17.384	2.116	6.159	0.779	2.780	17.929	2.019	6.124
12	137	0.830	2.406	15.805	2.000	4.690	0.829	2.410	17.180	2.000	4.937	0.830	2.336	16.346	2.000	4.722

* See equation (A-2)

Table S 6. Mixed Exponential Distribution, PRISM 1981-2010 Wet Day Precipitation Depth for Region 1

Month	Region 1 (northeast region)				
	α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean
1	0.55804	1.31119	7.93070	1.62000	4.2368
2	0.46286	1.74340	8.63320	2.53000	5.4442
3	0.51344	1.59517	11.23636	2.41000	6.2861
4	0.55679	1.98006	12.66595	2.58000	6.7162
5	0.43080	3.25281	11.49912	4.29000	7.9466
6	0.26051	3.56237	10.62137	5.69000	8.7825
7	0.37269	2.22983	10.31491	3.87000	7.3017
8	0.71043	4.37228	15.98819	4.13000	7.7359
9	0.51253	2.99536	14.61038	4.31000	8.6573
10	0.56964	3.06006	18.64841	4.05000	9.7686
11	0.70424	3.44667	14.20616	3.25000	6.6289
12	0.88989	2.88764	18.92257	1.99000	4.6532

* See equation (A-2)

Table S 7. Mixed Exponential Distribution, PRISM 1981-2010 Wet Day Precipitation Depth for Region 2

Month	Region 2 (southeast region)				
	α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean
1	0.5315	1.3780	9.5663	1.8800	5.2143
2	0.3166	1.2336	9.4574	3.3450	6.8541
3	0.5154	2.3365	13.5044	3.3600	7.7488
4	0.5953	2.7267	17.3474	3.5800	8.6431
5	0.2000	2.1722	12.4908	5.8850	10.4267
6	0.3118	2.9793	15.0478	6.4300	11.2850
7	0.4720	3.3463	13.8965	4.6700	8.9170
8	0.4690	2.4619	12.9637	3.7900	8.0385
9	0.3875	2.5351	14.1427	4.7600	9.6443
10	0.6028	3.3954	21.2829	4.3300	10.5002
11	0.4089	1.9098	13.1621	4.1100	8.5606
12	0.8402	3.5239	18.6305	2.5500	5.9375

* See equation (A-2)

Table S 8. Mixed Exponential Distribution, PRISM 1981-2010 Wet Day Precipitation Depth for Region 3

Month	Region 3 (southwest region)				
	α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean
1	0.4976	1.1994	7.7022	1.7350	4.4661
2	0.4695	1.6639	9.1659	2.4600	5.6441
3	0.5445	1.5975	12.2211	2.2900	6.4363
4	0.6566	2.1907	15.0326	2.5200	6.6009
5	0.2675	2.1203	10.7098	4.6200	8.4118
6	0.3873	3.6765	13.4952	5.5600	9.6924
7	0.3744	2.1541	11.5939	4.1300	8.0592
8	0.6202	4.5942	19.5742	4.9600	10.2831
9	0.5101	3.4365	18.5390	4.7050	10.8354
10	0.5657	2.9244	17.7571	3.8900	9.3665
11	0.6115	3.6422	13.1547	4.4800	7.3381
12	0.8577	3.2829	13.2909	2.3800	4.7070

* See equation (A-2)

Table S 9. Mixed Exponential Distribution, PRISM 1981-2010 Wet Day Precipitation Depth for Region 4

Month	Region 4 (northwest region)				
	α^*	μ_1^*	μ_2^*	Sample Median	Distribution Mean $\approx$ Sample Mean
1	0.5417	1.2814	7.5109	1.5900	4.1366
2	0.4305	1.4846	8.9187	2.5100	5.7187
3	0.5472	1.5914	12.8593	2.2600	6.6936
4	0.5879	2.3081	14.3427	2.9000	7.2673
5	0.3643	3.0827	12.8600	5.0100	9.2984
6	0.9871	8.0092	91.1262	5.2650	9.0802
7	0.4825	2.3907	10.7334	3.2800	6.7079
8	0.5934	4.1884	15.8250	4.7100	8.9201
9	0.5072	3.1845	14.3800	4.3100	8.7021
10	0.5285	2.9528	15.7483	3.9800	8.9864
11	0.7370	3.7965	13.9779	3.4500	6.4743
12	0.9066	2.8015	18.2105	1.8900	4.2414

* See equation (A-2)

Table S 10. Maximum Daily Precipitation and Extreme Event Depths and Truncation Multipliers

Parameter	Value (mm)	Multiplier
PRISM 1981-2010 maximum daily depth	200.7	
LOCA 2011-2040 maximum daily depth	199	0.995*
LOCA 2041-2070 maximum daily depth	192	0.960*
LOCA 2071-2099 maximum daily depth	205	1.025*
50-year recurrence, 24-hour depth	228.6	1.139*
Average of 50-year and 100-year recurrence, 24-hour depths	252.5	1.253*
100-year recurrence, 24-hour depth	274.3	1.367*
100-year recurrence, daily depth (divide by 1.13)	242.7	1.210*
200-year recurrence, daily depth (divide by 1.13)	292.2	1.456*

*PRISM observed grid cell maximum of 200.7 mm used to calculate multiplier

Table S 11. Monthly Water Balance Modeling Framework Analysis - Water Budget Summary Results

Water Budget Parameter		Climate Normals			
		Data Interval 1981 – 2010	Projection 1 2011 - 2040	Projection 2 2041 – 2070	Projection 3 2071 - 2100
Precipitation (P)	Cumulative Ensemble Average (mm)	18,031	18,533	18,944	19,161
	Average Annual (mm)	601	618	631	639
Actual Evapotranspiration (AET)	Cumulative Ensemble Average (mm)	16,519	16,393	16,775	16,981
	Average Annual (mm)	551	546	559	566
	Percentage of Precipitation	91.6%	88.5%	88.55%	88.6%
Runoff (RO)	Cumulative Ensemble Average (mm)	609	862	874	879
	Average Annual (mm)	20	29	29	29
	Percentage of Precipitation	3.4%	4.7%	4.61%	4.6%
Recharge (Re)	Cumulative Ensemble Average (mm)	903	1,277	1,295	1,302
	Average Annual (mm)	30	43	43	43
	Percentage of Precipitation	5.0%	6.9%	6.84%	6.8%

Table S 12. Continuous Simulation, Distributed Parameter Framework Analysis - Water Budget Summary Results

Water Budget Parameter		Climate Normals			
		Data Interval 1981 – 2010	Projection 1 2011 - 2040	Projection 2 2041 – 2070	Projection 3 2071 - 2100
Precipitation (P)	Cumulative Ensemble Average (mm)	18,072	18,577	18,991	19,210
	Average Annual (mm)	602	619	633	640
Actual Evapotranspiration (AET)	Cumulative Ensemble Average (mm)	14,554	14,533	14,809	14,937
	Average Annual (mm)	485	484	494	498
	Percentage of Precipitation	80.538%	78.2%	77.98%	77.75%
Runoff (RO)	Cumulative Ensemble Average (mm)	202	290	314	340
	Average Annual (mm)	7	10	10	11
	Percentage of Precipitation	1.115%	1.6%	1.65%	1.77%
Recharge (Re)	Cumulative Ensemble Average (mm)	3,316	3,754	3,868	3,933
	Average Annual (mm)	111	125	129	131
	Percentage of Precipitation	18.347%	20.2%	20.37%	20.48%

Table S 13. Daily Precipitation Depth Truncation Values by Month and Scenario

Data Source	Scenarios	Multiplier	Monthly Maximum Truncation Depth (mm)											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PRISM 1981-2010	All Scenarios Data Interval	1.0	35.7	73.2	102.4	98.3	103.2	123.4	73.7	200.7	130.3	117.2	75.7	76.7
LOCA 2011-2040	Scenario 1 and 3 Projection Interval 1	0.995	36	73	102	98	103	123	73	200	130	117	75	76
LOCA 2041-2070	Scenario 1 and 3 Projection Interval 2	0.960	34	70	98	94	99	118	71	193	125	113	73	74
LOCA 2071-2099	Scenario 1 and 3 Projection Interval 3	1.025	37	75	105	101	106	127	76	206	134	120	78	79
50-year recurrence, 24-hour depth	Scenario 2 Projection Interval 1	1.139	41	83	117	112	118	141	84	229	148	134	86	87
Average of 50-year and 100-year recurrence, 24-hour depths	Scenario 2 Projection Interval 2	1.253	45	92	128	123	129	155	92	251	163	147	95	96
100-year recurrence, 24-hour depth	Scenario 2 Projection Interval 3	1.367	49	100	140	134	141	169	101	274	178	160	103	105
100-year recurrence, daily depth	Final Analysis Projection Intervals, H0 pathway	1.210	43	88	124	119	125	149	89	243	158	142	92	93
200-year recurrence, daily depth	Final Analysis Projection Intervals, H1 Pathway	1.456	52	107	149	143	150	180	107	292	190	171	110	112

Table S 14. Weights and Areas for PRISM Grid Cells

PRISM Grid ID	Area (km ²)	Weight (%)
665148	0.8115	0.18%
666551	0.0167	0.00%
666552	2.0644	0.45%
666553	10.2957	2.23%
667952	0.0001	0.00%
667953	3.5003	0.76%
667954	4.3556	0.94%
667955	9.2203	2.00%
667956	13.3092	2.89%
667957	18.4119	3.99%
667958	6.9303	1.50%
669356	0.1868	0.04%
669357	7.5684	1.64%
669358	18.5552	4.03%
669359	18.5545	4.03%
669360	18.5538	4.03%
669361	18.5531	4.03%
669362	13.9969	3.04%
669363	0.0921	0.02%
670761	5.6504	1.23%
670762	18.5635	4.03%
670763	18.5628	4.03%
670764	18.5621	4.03%
670765	18.5615	4.03%
670766	17.0355	3.70%
670767	4.4385	0.96%
672166	6.7161	1.46%
672167	18.5712	4.03%
672168	18.5705	4.03%
672169	18.5698	4.03%
672170	17.0940	3.71%
672171	5.7483	1.25%
673571	5.1628	1.12%
673572	18.5788	4.03%
673573	18.5781	4.03%
673574	18.1040	3.93%
673575	3.2700	0.71%
674976	0.1696	0.04%

PRISM Grid ID	Area (km ²)	Weight (%)
674977	12.9587	2.81%
674978	18.5858	4.03%
674979	8.9108	1.93%
676382	1.2942	0.28%
676383	3.1784	0.69%
676384	0.5087	0.11%
Total	461	100%

Table S 15. Weights and Areas for 'LOCA Archive' Grid Cells

LOCA Grid ID	Area (km ²)	Weight (%)
62	4.4970	0.98%
63	32.1951	6.98%
64	9.6007	2.08%
76	22.1667	4.81%
77	41.4679	9.00%
78	34.9715	7.59%
79	3.9499	0.86%
90	23.2167	5.04%
91	42.1373	9.14%
92	42.0978	9.13%
93	36.3863	7.89%
94	4.5499	0.99%
104	2.5992	0.56%
105	26.7367	5.80%
106	36.1240	7.84%
107	41.1152	8.92%
108	25.4257	5.52%
120	0.4750	0.10%
121	4.1691	0.90%
122	22.3699	4.85%
123	3.9276	0.85%
137	0.7414	0.16%
Total	461	100%

Table S 16. Site-Specific Scenarios Examined for Weather Generator Calibration

Scenario	Scenario 1	Scenario 2	Scenario 3
Description	LOCA statistics	LOCA statistics with 100-yr, 24-hr events	LOCA statistics except for PRISM precipitation occurrence
Data Interval¹: 1981-2010			
Dry spell source	PRISM 1981-2010 (Table S 3)	PRISM 1981-2010 (Table S 3)	PRISM 1981-2010 (Table S 3)
Wet spell source	PRISM 1981-2010 (Table S 4)	PRISM 1981-2010 (Table S 4)	PRISM 1981-2010 (Table S 4)
Precipitation depth truncation source (Table S 13)	PRISM 1981-2010 monthly maximum across all grid cells in Figure 5 ³		
Projection Interval 1: 2011-2040			
Dry spell source	LOCA 2011-2040 (Table S 3)	LOCA 2011-2040 (Table S 3)	PRISM 1981-2010 (Table S 3)
Wet spell source	LOCA 2011-2040 (Table S 4)	LOCA 2011-2040 (Table S 4)	PRISM 1981-2010 (Table S 4)
Precipitation depth truncation source (Table S 13)	Scaled LOCA max 2011-2040 ²	Scaled 24-hr, recurrence intervals ⁴	Scaled LOCA max 2011-2040 ²
Projection Interval 2: 2041-2070			
Dry spell source	LOCA 2041-2070 (Table S 3)	LOCA 2041-2070 (Table S 3)	PRISM 1981-2010 (Table S 3)
Wet spell source	LOCA 2041-2070 (Table S 4)	LOCA 2041-2070 (Table S 4)	PRISM 1981-2010 (Table S 4)
Precipitation depth truncation source (Table S 13)	Scaled LOCA max 2041-2070 ²	Scaled 24-hr, recurrence intervals ⁴	Scaled LOCA max 2041-2070 ²
Projection Interval 3: 2071-2100			
Dry spell source	LOCA 2071-2099 (Table S 3)	LOCA 2071-2099 (Table S 3)	PRISM 1981-2010 (Table S 3)
Wet spell source	LOCA 2071-2099 (Table S 4)	LOCA 2071-2099 (Table S 4)	PRISM 1981-2010 (Table S 4)
Precipitation depth truncation source (Table S 13)	Scaled LOCA max 2071-2099 ²	Scaled 24-hr, recurrence intervals ⁴	Scaled LOCA max 2071-2099 ²

¹ Data Interval, 1981 – 2010, always employs the same formulation and is the same across all three scenarios.

² Scaled LOCA maximums are calculated starting with the PRISM 1981-2010 monthly maximum values in note #3. These values are multiplied by a scaling factor calculated as the LOCA maximum across all grid cells in Figure 1 for the interval divided by the PRISM 1981-2010 daily maximum value across all grid cells, see Table S 13.

³ The maximum daily precipitation depth from all PRISM 1981-2010 grid cells in Figure 1 is used to truncate the mixed exponential, precipitation depth distributions for each month, see Table S 13.

⁴ PRISM 1981-2010 monthly maximum values from #3 provide the starting point in this calculation and these values are multiplied by a scaling factor, which is calculated as a specified extreme event depth divided by the PRISM 1981-2010 daily maximum value across all grid cells. For Projection Interval 1: 2011-2040 the extreme event depth used to calculate the scaling factor is the 50-yr recurrence interval, 24-hr depth from Table C - 1. The 100-yr recurrence interval, 24-hr depth from Table C - 1 is used in the scaling factor calculation for Projection Interval 3 and the average of the 50-yr and 100-yr depths is used in scaling factor determination for Projection Interval 2, see Table S 13.

Table S 17. Pertinent Soil Properties from SSURGO

Descriptor	Value	Percentage of Watershed	Notes
Hydrologic Soil Group	D: Very slow infiltration and high runoff	92%	General condition outside of dry stream beds Located only in dry stream beds and valley bottoms
Hydrologic Soil Group	C: Slow infiltration	1%	
Hydrologic Soil Group	A: High infiltration	7%	
Available Water Supply	1 – 2 cm	88.5%	Uplands and away from stream beds
Available Water Supply	3 – 4 cm	4%	Valley bottom areas outside of stream beds
Available Water Supply	10 – 23 cm	7.5%	Stream beds
Depth to Restrictive Layer	> 201 cm	8.2%	Stream beds
Depth to Restrictive Layer	30 – 50 cm	53.7%	Hillsides
Depth to Restrictive Layer	20 – 25 cm	38.1%	Ridgetops

Figure S - 1. Study Site Location and Watershed Showing Hydrologic Soil Groups 1

Figure S - 2. Dolan Creek and Devils River Confluence, Fort Terrett Limestone Outcrop, and Mapped Spring Locations 2

Figure S - 3. Schematic of Thornthwaite and Mather-style water balance calculation..... 3

Figure S - 4. Average Temperature, Day of the Year Wet State and Dry State Comparison..... 4

Figure S - 5. Observed Dry Spell Durations by Month and Data Set..... 5

Figure S - 6. Observed Wet Spell Durations by Month and Data Set..... 7

Figure S - 7. Observed Site Watershed, Wet Day Precipitation Depth by Month and Data Set 9

Figure S - 8. Simulated Daily Temperature by Day of the Year, Compared with Temperature Observations from PRISM 1981 – 2010 and the ‘LOCA Archive’ 11

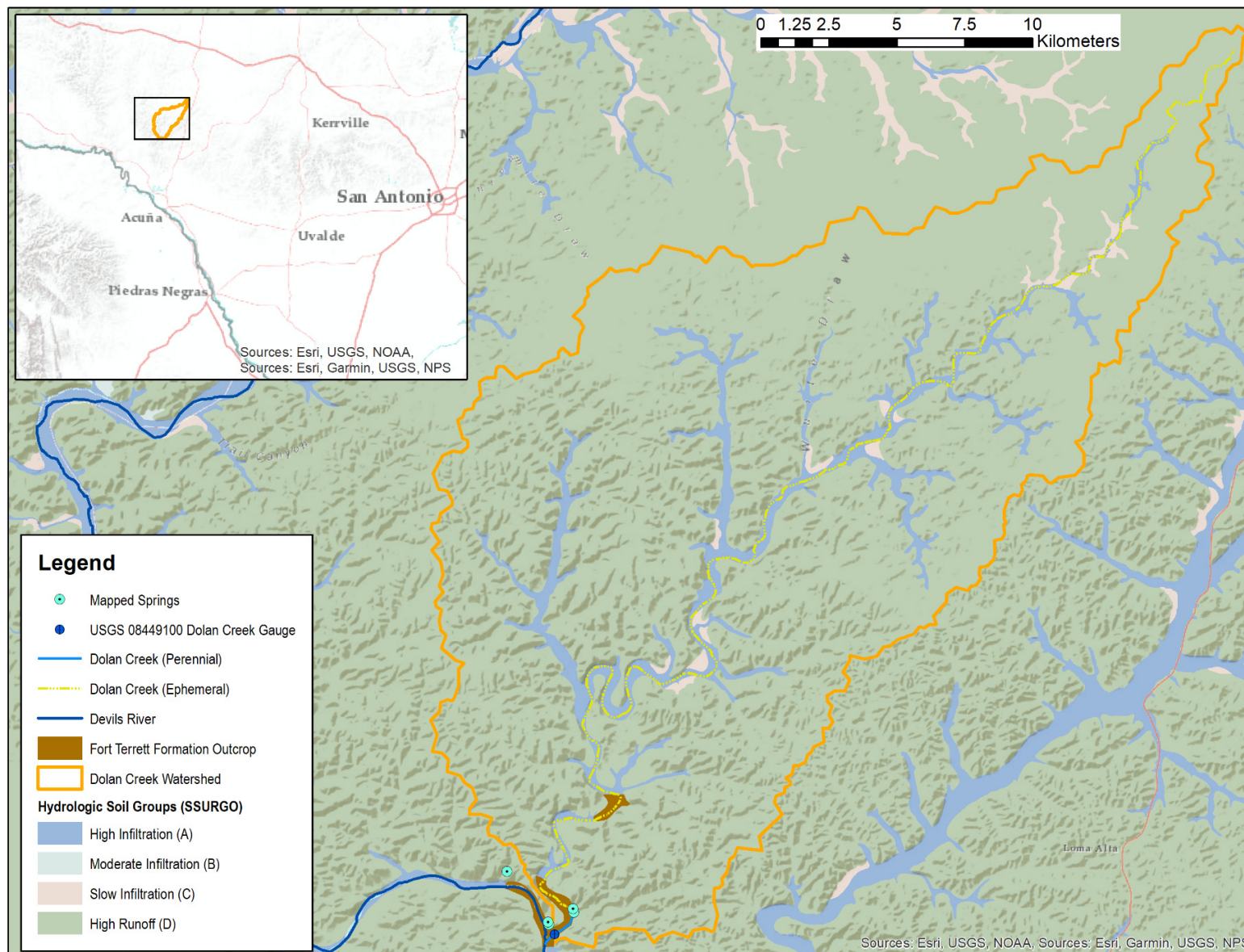


Figure S - 1. Study Site Location and Watershed Showing Hydrologic Soil Groups. The study site is located to the west of San Antonio, TX. Hydrologic soil group mapping suggest that dry stream valleys are the primary location of infiltration.

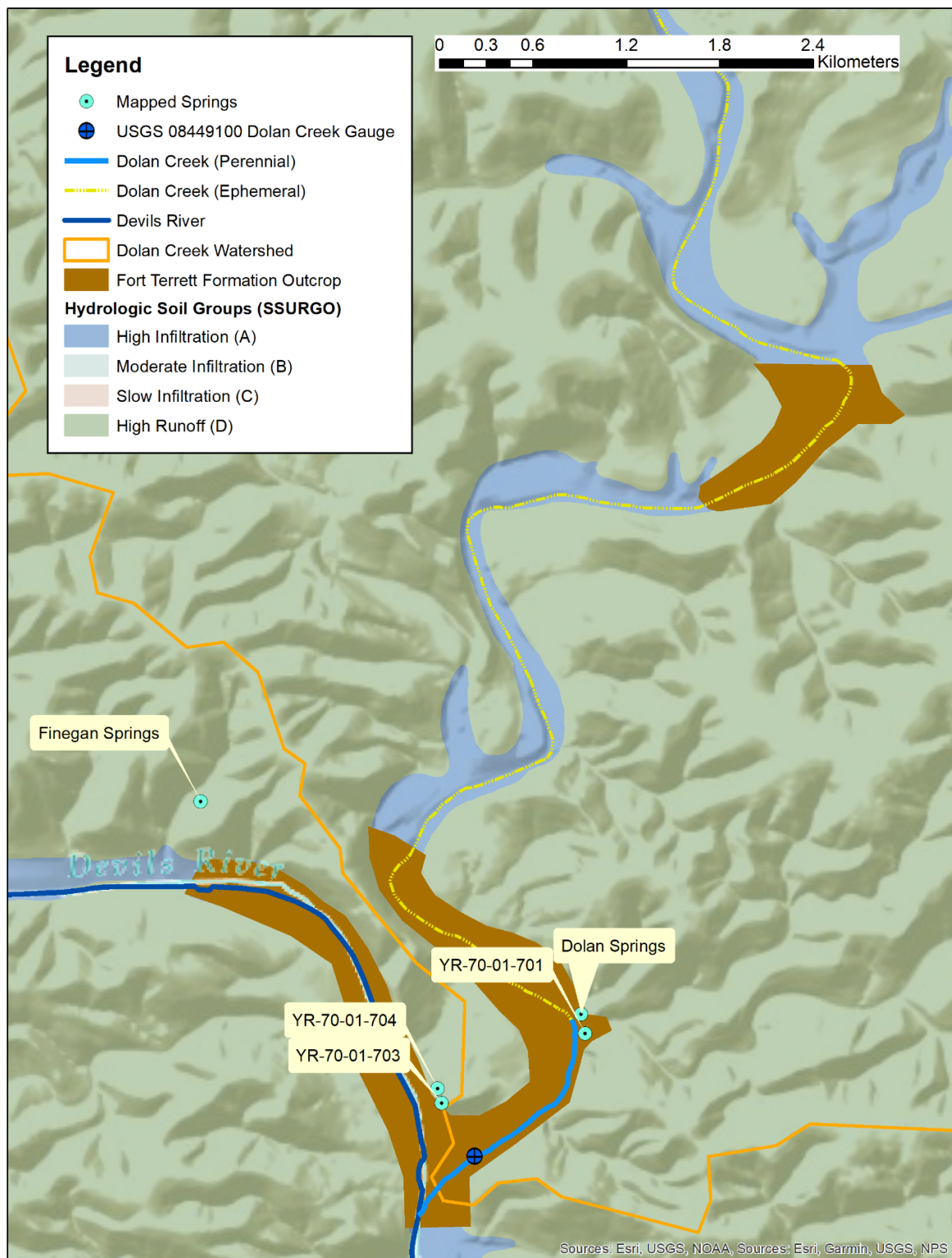


Figure S - 2. Dolan Creek and Devils River Confluence, Fort Terrett Limestone Outcrop, and Mapped Spring Locations. Dolan Creek is ephemeral and typically dry except for the downstream-most segment adjacent to the confluence with the Devils River. This perennial reach corresponds to outcrop locations for the Fort Terrett limestone and the location of Dolan Springs. The Fort Terrett limestone is hypothesized to provide an impermeable base to the watershed. Spring discharge is hypothesized to occur at or associated with the contact of the Fort Terrett and overlying Segovia limestone.

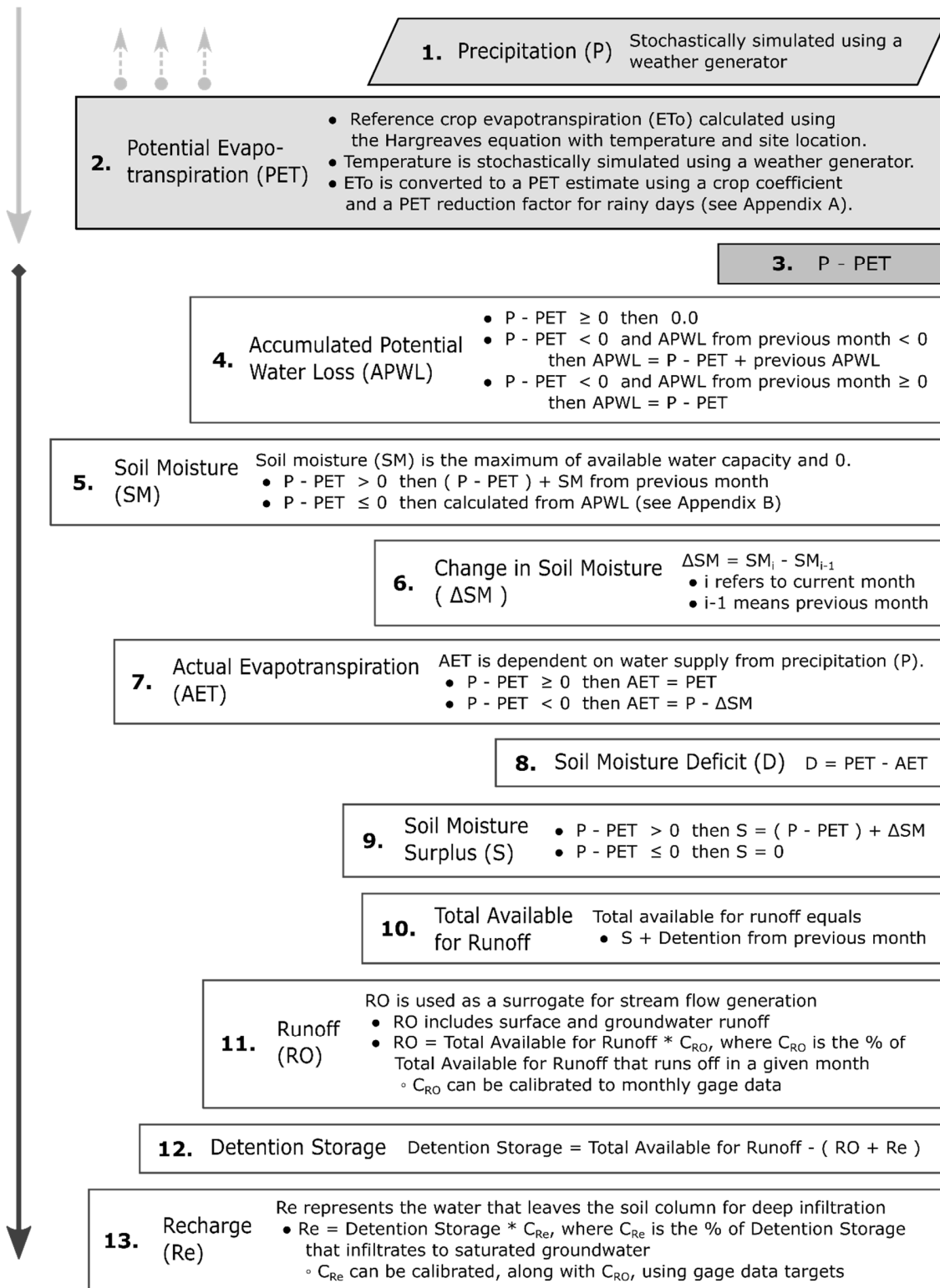


Figure S - 3. Schematic of Thornthwaite and Mather-style water balance calculation. Precipitation (P) and potential evapotranspiration (PET) are the inputs to the calculation. In this implementation, PET is estimated from simulated air temperature. If $P \geq PET$, then $P - PET$ provides the water distributed through the soil column in the calculation steps. If $P < PET$, then actual evapotranspiration (AET) is limited by the available water supply, which is comprised of P and available soil moisture supply.

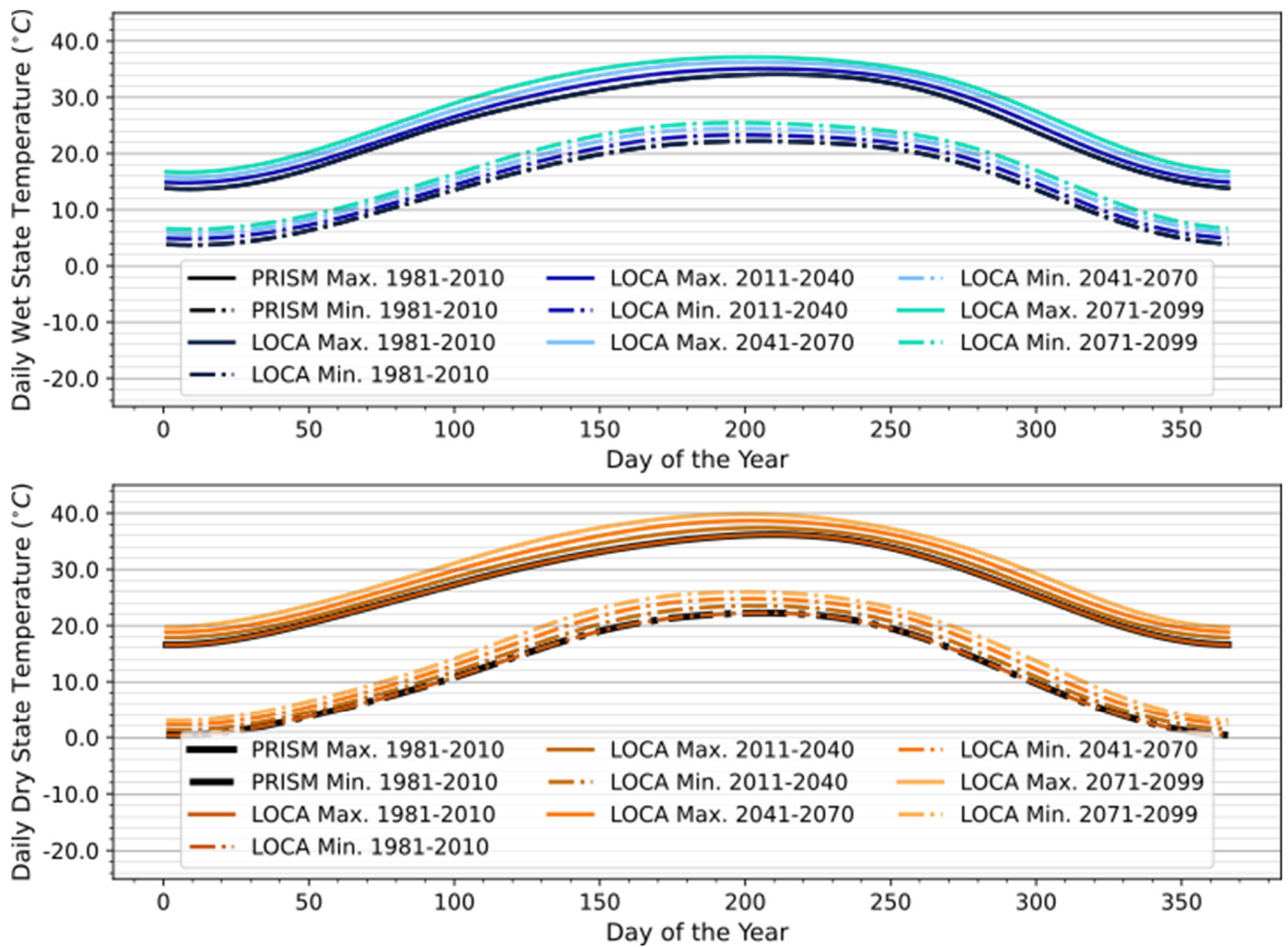


Figure S - 4. Average Temperature, Day of the Year Wet State and Dry State Comparison. Day of the year averages are calculated for both data sets and all four Climate Normals. Temperature consistently increases for future Climate Normals.

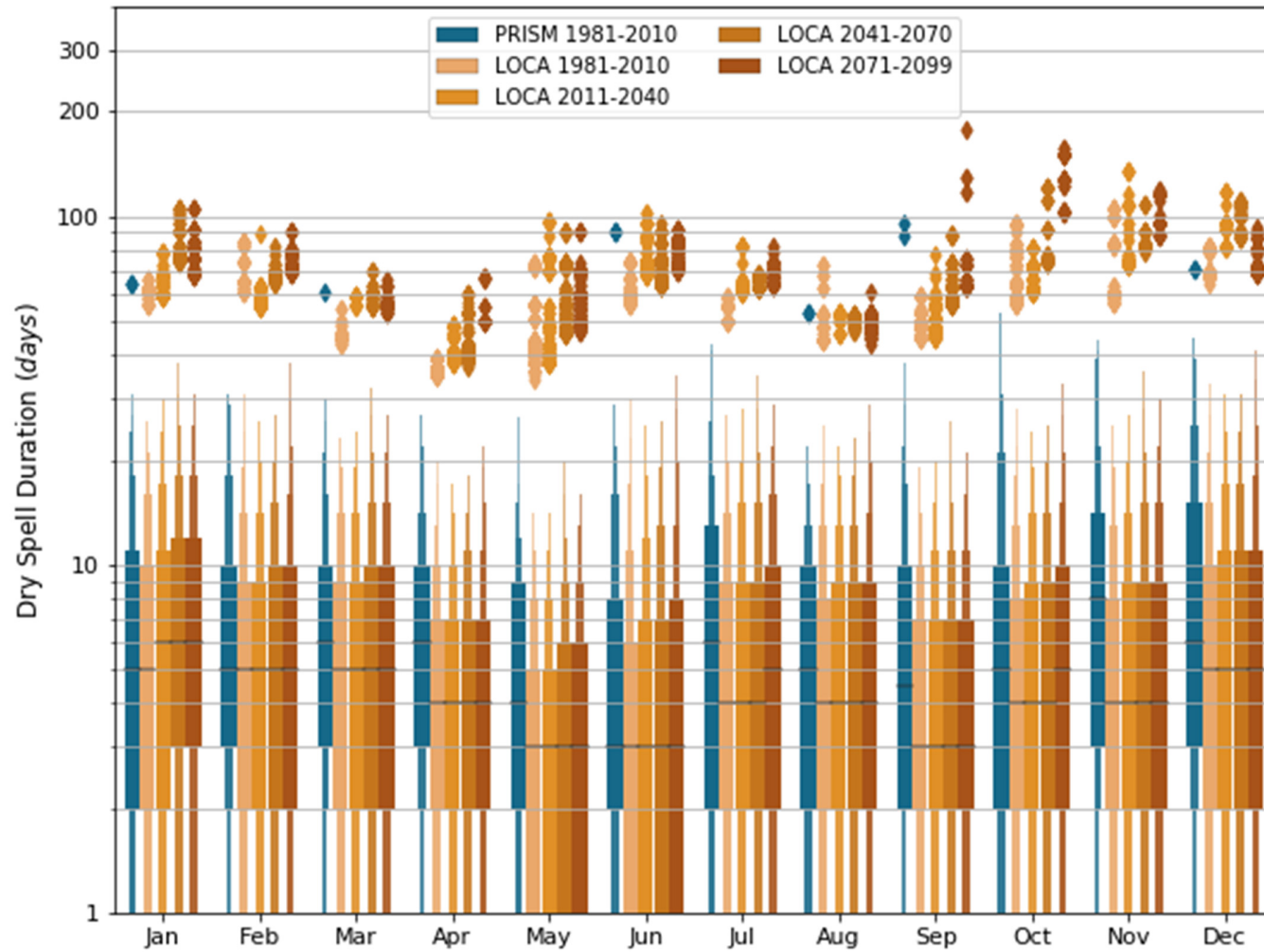


Figure S - 5. Observed Dry Spell Durations by Month and Data Set. A letter-value (Hofmann et al., 2017), or boxen (Waskom et al., 2020), plot is similar to the box plot, or box and whisker plot, and is optimized for showing additional information and structure of the empirical distribution of the data set within designated categories. In the boxen plot, the horizontal gray line denotes the median; a number of quantiles are also shown which are defined as “letter” values. The innermost and thickest box, which is the box containing the median, is the interquartile box (1/4 and 3/4 quantiles) and is equivalent to the box plot box. The next box out from the interquartile box, which is the next thickest, represents the eighths (1/8

and 7/8 quantiles). Beyond the eighths are the sixteenths (1/16 and 15/16 quantiles) and so forth. Dry spell length is attributed to the month when the contiguous streak of dry days begins. LOCA dry spell length, empirical distributions are similar across all four analysis intervals. Median dry spell length from the LOCA Archive is smaller than median dry spell length in the PRISM data set for March – May and July – December, which is 9 out of 12 months. Additionally, the 25th percentile dry spell length (1/4 quantile) in the LOCA Archive is shorter than the 25th percentile dry spell length in the PRISM data set for February – June and November – December, which is 7 out of 12 months.

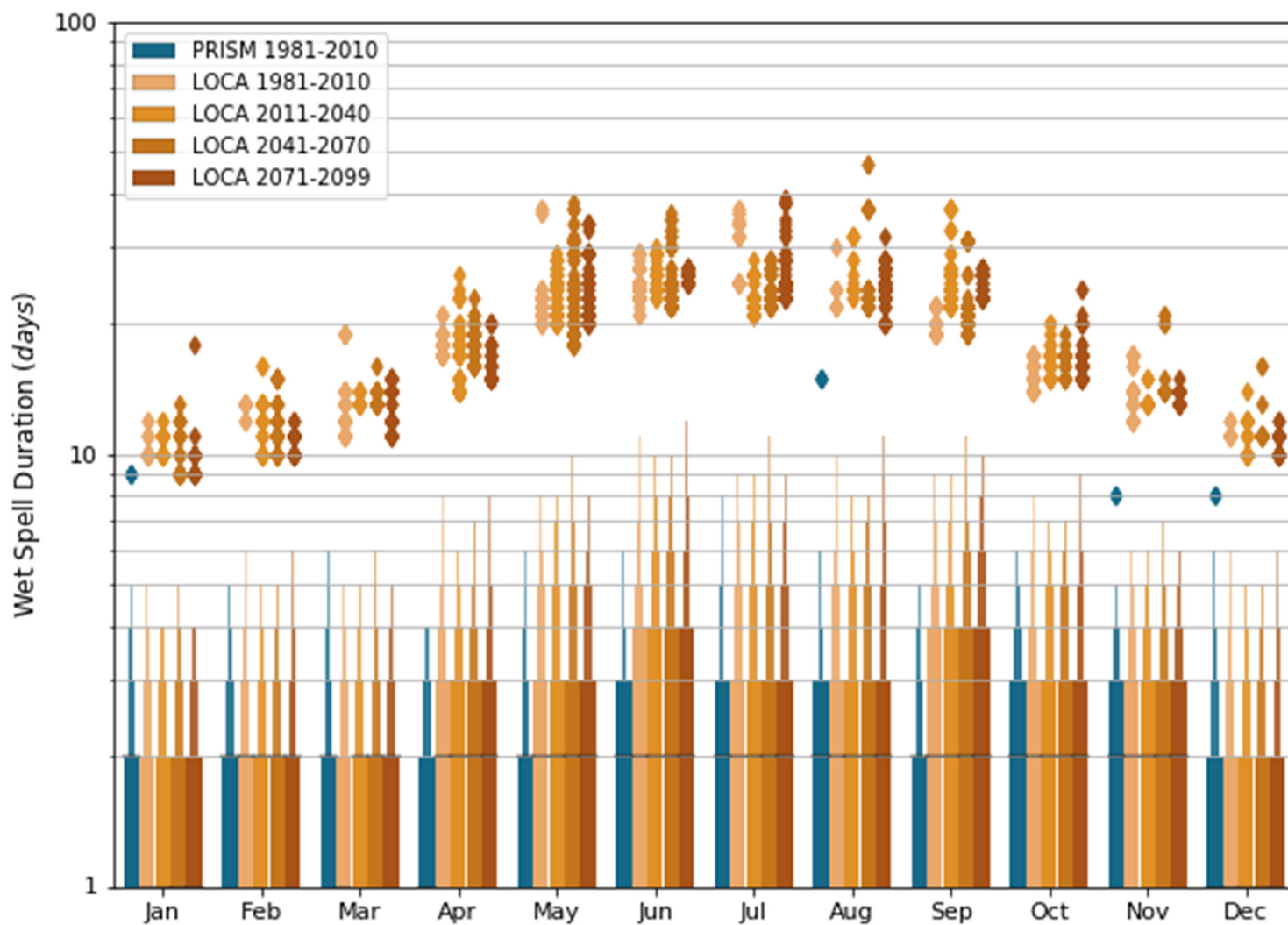


Figure S - 6. Observed Wet Spell Durations by Month and Data Set. Wet spell length, monthly letter-value plot. Wet spell length is attributed to the month when the contiguous streak of wet days begins. LOCA wet spell length, interquartile ranges are similar across all four analysis intervals and the empirical distributions are similar except for some variation in the high magnitude tails. The larger magnitude tail of the empirical LOCA

wet spell length distributions, for example compare the 7/8 quantile, extends to consistently larger values than the 7/8 quantile in the PRISM data set for April – September, which is 6 of 12 months.

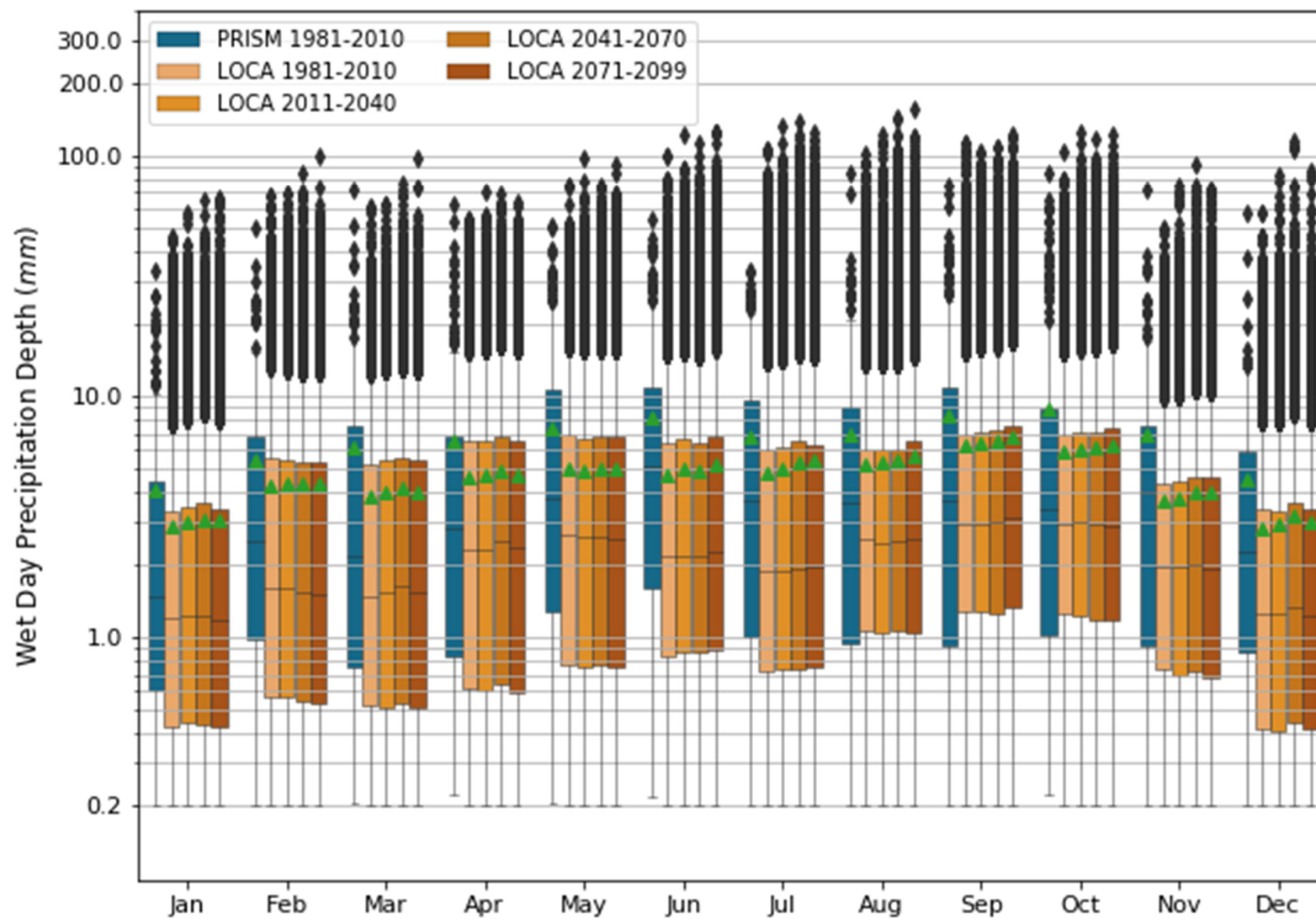


Figure S - 7. Observed Site Watershed, Wet Day Precipitation Depth by Month and Data Set. LOCA empirical distributions are similar across all four intervals and tend to have similar mean and median values. LOCA mean and median values are consistently smaller than PRISM mean and

median values. PRISM mean and median values, shown for each month, display more variation across the year than the LOCA mean and median values. The LOCA ensembles provide maximum, daily values for each month that tend to be larger than the PRISM maximum daily values; this is expected from the comparison of an ensemble to a single realization.

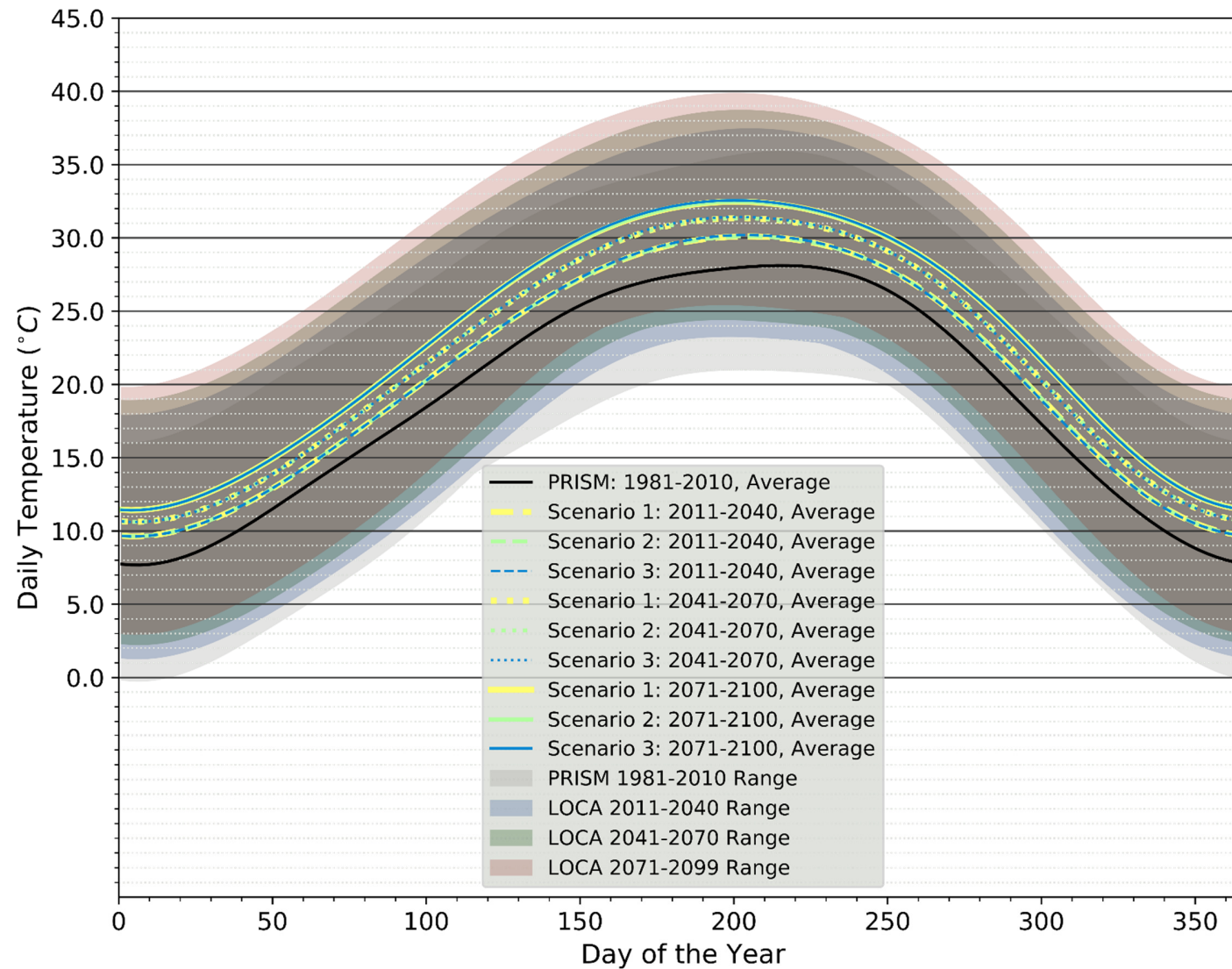


Figure S - 8. Simulated Daily Temperature by Day of the Year, Compared with Temperature Observations from PRISM 1981 – 2010 and the ‘LOCA Archive’. Simulated temperature values are effectively the same for each scenario as expected. Additionally, simulated average daily

temperatures provide an approximately 3 °C increase from 1981-2010 through 2070-2100. Temperature curves are smoothed or filtered average time histories. The upper range bound is the smoothed, average day of the year maximum temperature, and the lower range bound is the smoothed, average day of the year minimum temperature.