

SUPPLEMENTAL MATERIALS

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Reservoir Operators React to Uncertainty in Snowmelt Runoff Forecasts

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Table S1. Characteristics of the reservoir datasets that were aggregated to the basin level in the panel data model

Basin attributes					Individual reservoir attributes										
River basin	Forecast and release location	Latitude	Longitude	Basin storage capacity (Km ³)	Reservoirs	Drainage area above reservoirs (Km ²)	Precipitation stations	Snow courses	Snow pillows	Name	Operator	Storage capacity (Km ³)	Elevation (meters)	Longitude	Latitude
Sacramento	Sacramento above Bend	-122.186	40.289	6.1	8	17262	8	12	10	Iron Canyon	PGE	0.03	815	-121.981	41.045
										Whiskeytown	USBR	0.30	369	-122.537	40.598
										McCloud	PGE	0.04	823	-122.074	41.135
										Britton	PGE	0.05	836	-121.676	41.022
										Pit No. 7	PGE	0.04	316	-122.015	40.843
										Pit No. 6	PGE	0.02	10	-122.001	40.842
										Shasta	USBR	5.61	325	-122.42	40.718
Feather	Feather at Oroville	-121.547	39.522	6.7	11	9342	8	22	10	Keswick	USBR	0.03	182	-122.4457	40.6121
										Oroville	CADWR	4.36	274	-121.493	39.54
										Almanor	PGE	1.61	1402	-121.173	40.218
										Bucks	PGE	0.13	1575	-121.202	39.897
										Little Grass Valley	SFWP	0.11	1538	-121.019	39.724
										Davis	CADWR	0.10	1758	-120.467	39.883
										Sly Creek	SFWP	0.08	1078	-121.116	39.584
										Frenchman	CADWR	0.07	1682	-120.183	39.883
										Butt Valley	PGE	0.06	1263	-121.186	40.187
										Mountain Meadows	PGE	0.03	1538	-121.017	40.283
										Antelope	CADWR	0.03	1512	-120.607	40.18
Thermalito Total	CADWR	0.10	43	-121.638	39.458										
Yuba	Yuba at Smartville	-121.274	39.235	1.85	8	2849	10	20	5	New Bullards Bar	YCWA	1.19	599	-121.14	39.393
										Lake Spaulding	YBDS	0.18	1643	-120.658	39.441
										Englebright	USACE	0.09	168	-121.267	39.239
										Jackson Meadows	YBDS	0.09	1840	-120.552	39.509
										Scotts Flat	YBDS	0.06	940	-120.917	39.274
										French Lake	YBDS	0.02	2031	-120.544	39.44
										Rollins	YBDS	0.08	663	-120.948	39.135
Bowman	YBDS	0.08	1697	-120.652	39.45										
American	American at Folsom	-121.183	38.683	2.17	12	4882	10	28	17	Folsom	USBR	1.21	142	-121.183	38.683
										Natoma	USBR	0.01	40	-121.183	38.65
										Union Valley	SMUD	0.33	1484	-120.438	38.864
										Hell Hole	PCWA	0.26	1411	-120.407	39.058
										French Meadows	PCWA	0.17	1604	-120.468	39.112
										Loon	SMUD	0.09	1954	-120.323	38.983
										Ice House	SMUD	0.05	1662	-120.359	38.824
										Caples	EDID	0.03	2377	-120.048	38.707
										Stumpy Meadows	GDPUD	0.02	1302	-120.603	38.903
										Slab Creek	SMUD	0.02	564	-120.6994	38.7725
										Silver	EDID	0.01	2174	-120.121	38.669
										Lake Valley	YBDS	0.01	1785	-120.583	39.3
										Jenkinson	EDID	0.05	1061	-120.56	38.713
Mokelumne	Mokelumne at Pardee	-120.719	38.313	1.07	4	1603	8	19	10	Camanche	EBMUD	0.51	72	-121.021	38.225
										Pardee	EBMUD	0.26	173	-120.85	38.25
										Salt Springs	PGE	0.18	1128	-120.216	38.497
										Lower Bear	PGE	0.06	1775	-120.257	38.538
Stanislaus	Stanislaus at Melones	-120.637	37.852	3.5	8	2331	9	17	10	New Melones	USBR	2.96	346	-120.525	37.9481
										New Spicer Meadows	NCPA	0.23	1986	-119.998	38.393
										Beardeley	TriDam	0.12	1036	-120.075	38.203
										Tulloch	TriDam	0.08	157	-120.603	37.875
										Donnells	TriDam	0.08	1474	-119.96	38.329
										Pinecrest	PGE	0.02	1713	-119.983	38.2
										Relief	PGE	0.02	2201	-119.733	38.267
										Lyons	PGE	0.01	1260	-120.166	38.094
Tuolumne	Tuolumne at Don Pedro	-120.441	37.666	3.44	6	3994	9	21	10	New Don Pedro	TID	2.50	253	-120.421	37.702
										Hetch Hetchy	SF	0.44	1180	-119.783	37.95
										Cherry	SF	0.33	1437	-119.913	37.976
										Turlock	TID	0.06	74	-120.583	37.6
										Modesto	MID	0.04	64	-120.675	37.657
Eleanor	SF	0.04	1420	-119.88	37.974										
Merced	Merced at Exchequer	-120.331	37.522	1.28	2	2686	7	13	11	McClure	MID	1.26	264	-120.267	37.584
										McSwain	MID	0.01	130	-120.309	37.52
San Joaquin	San Joaquin at Friant	-119.724	36.984	1.42	8	4338	8	21	16	Millerton	USBR	0.64	177	-119.705	37.001
										Shaver	SCE	0.17	1637	-119.302	37.145
										Thomas A. Edison	SCE	0.15	2329	-118.987	37.37
										Mammoth Pool	SCE	0.15	1015	-119.328	37.329
										Huntington	SCE	0.11	2134	-119.221	37.228
										Florence	SCE	0.08	2233	-118.967	37.267
										Crane Valley	PGE	0.06	1030	-119.517	37.283
Redinger	SCE	0.04	428	-119.449	37.145										
Kings	Kings at Pine Flat	-119.335	36.831	1.53	3	4002	8	25	14	Pine Flat	USACE	1.23	296	-119.325	36.833
										Helms Creek	PGE	0.15	2497	-118.967	37.072
Wishon	PGE	0.16	1999	-118.969	37.005										
Kaweah	Kaweah at Terminous	-119.003	36.412	0.23	1	1453	10	16	8	Kaweah	USACE	0.23	229	-119.002	36.415
Tule	Tule at Success	-118.922	36.061	0.1	1	1018	10	7	3	Success	USACE	0.10	211	-118.922	36.061
Kern	Kern at Isabella	-118.484	35.639	0.7	1	5372	8	24	12	Isabella	USACE	0.70	803	-118.473	35.646

Table S2. Individual fixed effects for the 14 basins in the panel data model

Basin	Individual fixed effect (μ_i)	Robust standard error	t-Statistic	p-value
Sacramento	2.540	0.369	6.883	0.000
Feather	0.931	0.364	2.558	0.024
Yuba	0.451	0.323	1.394	0.187
American	0.810	0.329	2.461	0.029
Cosumnes	0.125	0.296	0.422	0.680
Mokolumne	0.273	0.305	0.895	0.387
Stanislaus	0.289	0.335	0.863	0.404
Tuolumne	0.207	0.334	0.620	0.546
Merced	0.396	0.305	1.301	0.216
San Joaquin	0.538	0.322	1.669	0.119
Kings	0.818	0.326	2.512	0.026
Kawea	0.236	0.396	0.597	0.561
Tule	0.066	0.385	0.172	0.866
Kern	0.326	0.420	0.776	0.452