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## Supplemental Material

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Unraveling the Relationships between Trend of Dam Inflows, Hydrometeorological Variables,  
and Vegetation in Western and Southwestern United States

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Table S1. *p*-values of the monotonic trend analyses of low inflow for annual and seasonal timescales in the study dams for the period of 1993-2022 (significance level = 0.05). Statistically significant values are highlighted in bold.

Dam	Annual	Spring	Summer	Fall	Winter
Buffalo Bill	0.335	0.187	0.943	0.212	0.544
Yellowtail	0.064	0.301	0.858	<b>0.017</b>	<b>0.027</b>
Big Sandy	0.382	0.509	0.498	0.363	0.369
Bull	0.972	0.943	0.643	0.064	0.721
Boysen	0.972	0.143	0.943	0.943	0.803
Causey	<b>0.001</b>	<b>0.002</b>	<b>0.038</b>	<b>0.004</b>	<b>0.017</b>
Clark Canyon	0.225	0.116	0.354	0.187	0.568
Currant Creek	0.061	0.392	0.284	<b>0.022</b>	<b>0.026</b>
Deer Creek	0.669	0.592	0.830	0.568	0.225
East Canyon	0.972	0.568	0.498	0.239	0.254
Flaming Gorge	0.643	0.199	0.284	0.568	0.199
Jordanelle	<b>0.000</b>	<b>0.046</b>	<b>0.001</b>	<b>0.005</b>	<b>0.013</b>
Huntington North	<b>0.000</b>	0.830	0.246	<b>0.001</b>	<b>0.000</b>
Jackson Gulch	<b>0.013</b>	0.143	0.080	0.239	<b>0.012</b>
Joes Valley	0.059	0.134	0.225	0.059	0.592
Powell Glen Canyon	0.254	<b>0.046</b>	0.915	0.669	0.125
Lemon	0.175	0.830	1.000	0.498	0.212
Tiber	0.101	0.498	<b>0.022</b>	0.080	0.232
Lost Creek	0.164	0.239	0.108	0.301	<b>0.007</b>
Mcphee	<b>0.050</b>	0.054	0.432	0.212	0.721
Meeks Cabin	0.326	0.817	0.454	0.669	0.957
Moon	0.762	0.555	<b>0.007</b>	<b>0.015</b>	0.803
Navajo	0.116	0.318	0.125	0.225	0.065
Newton	0.059	0.532	0.335	0.172	0.292
Red Fleet	<b>0.003</b>	<b>0.029</b>	<b>0.000</b>	<b>0.015</b>	0.225
Wanship	<b>0.000</b>	0.087	0.064	<b>0.027</b>	0.335
Scotfield	0.629	0.268	0.695	0.175	0.803
Sherburne	0.901	0.254	0.748	0.129	0.544
Starvation	0.498	0.643	0.116	0.887	0.246
Stateline	0.128	0.058	0.083	0.411	<b>0.043</b>
Steinaker	0.397	0.163	<b>0.050</b>	<b>0.002</b>	0.669
Soldier Creek	0.762	<b>0.035</b>	0.254	0.858	0.269
Taylor Park	0.803	0.412	0.858	0.721	0.412
Upper Stillwater	0.061	0.239	0.643	0.498	0.164

<b>Dam</b>	<b>Annual</b>	<b>Spring</b>	<b>Summer</b>	<b>Fall</b>	<b>Winter</b>
Vallecito	0.212	1.000	0.885	0.087	0.167
Willow Creek (MT)	0.419	0.345	0.748	0.207	0.326
Arthur V Watkins	0.153	0.292	0.284	0.382	0.695
Blue Mesa	0.134	0.187	0.887	0.059	0.432
Fontenelle	0.335	0.521	0.392	0.695	<b>0.017</b>
Paonia	0.134	0.087	<b>0.038</b>	<b>0.008</b>	0.568
Ridgway	0.199	0.432	0.101	<b>0.030</b>	0.887
Silver Jack	<b>0.005</b>	<b>0.000</b>	0.254	0.301	0.301
Folsom	<b>0.012</b>	<b>0.032</b>	0.521	0.054	0.125
Monticello	0.886	0.187	0.077	0.844	<b>0.000</b>
Bradbury	<b>0.001</b>	<b>0.004</b>	<b>0.014</b>	0.108	<b>0.030</b>
Friant	<b>0.021</b>	<b>0.006</b>	0.858	0.125	0.108
Whiskeytown	0.568	<b>0.010</b>	0.054	1.000	0.843
Spring Creek	0.129	0.204	0.592	0.194	0.915
New Melones	0.094	<b>0.046</b>	<b>0.030</b>	0.112	0.372
Trinity	0.074	<b>0.007</b>	<b>0.027</b>	0.129	0.108
Shasta	<b>0.005</b>	<b>0.005</b>	<b>0.000</b>	0.064	<b>0.000</b>

Table S2. *p*-values of the monotonic trend analyses of median inflow for annual and seasonal timescales in the study dams for the period of 1993-2022 (significance level = 0.05). Statistically significant values are highlighted in bold.

Dam	Annual	Spring	Summer	Fall	Winter
Buffalo Bill	<b>0.038</b>	0.284	0.972	0.143	0.094
Yellowtail	0.498	0.239	0.544	0.695	0.284
Big Sandy	0.972	0.301	0.354	0.972	<b>0.038</b>
Bull	0.104	0.116	0.521	0.284	0.643
Boysen	0.544	0.372	1.000	0.544	0.748
Causey	<b>0.000</b>	0.059	<b>0.003</b>	<b>0.000</b>	<b>0.000</b>
Clark Canyon	0.153	0.225	0.199	0.125	0.335
Currant Creek	0.748	0.748	1.000	0.116	0.929
Deer Creek	0.775	0.212	1.000	1.000	0.475
East Canyon	0.129	0.116	0.094	0.254	0.858
Flaming Gorge	0.748	0.432	0.301	0.721	0.544
Jordanelle	<b>0.001</b>	0.708	<b>0.000</b>	0.120	0.643
Huntington North	0.605	0.943	0.695	0.943	<b>0.007</b>
Jackson Gulch	<b>0.001</b>	<b>0.027</b>	<b>0.003</b>	<b>0.003</b>	<b>0.025</b>
Joes Valley	<b>0.015</b>	0.225	0.059	0.254	0.059
Powell Glen Canyon	<b>0.017</b>	<b>0.017</b>	0.392	<b>0.042</b>	0.087
Lemon	0.125	0.915	0.432	0.059	0.199
Tiber	0.617	0.475	0.392	0.695	0.199
Lost Creek	<b>0.005</b>	0.116	<b>0.006</b>	<b>0.008</b>	<b>0.022</b>
Mcphee	<b>0.022</b>	<b>0.020</b>	0.284	0.074	0.630
Meeks Cabin	0.521	0.175	0.254	0.830	<b>0.019</b>
Moon	0.134	<b>0.038</b>	0.059	0.901	0.164
Navajo	<b>0.022</b>	0.108	0.108	<b>0.011</b>	0.695
Newton	0.972	0.617	0.094	0.400	0.187
Red Fleet	<b>0.020</b>	0.592	<b>0.001</b>	<b>0.012</b>	<b>0.019</b>
Wanship	<b>0.001</b>	<b>0.010</b>	<b>0.002</b>	<b>0.001</b>	0.353
Scotfield	0.090	0.212	0.392	0.464	0.929
Sherburne	0.830	0.354	0.544	0.412	0.175
Starvation	0.617	0.454	0.187	0.721	0.872
Stateline	0.775	0.464	0.775	0.432	<b>0.002</b>
Steinaker	<b>0.002</b>	<b>0.006</b>	0.568	0.254	0.354
Soldier Creek	0.617	0.972	0.372	0.498	0.301
Taylor Park	0.129	0.748	0.354	0.104	0.748
Upper Stillwater	0.432	0.143	0.225	0.544	0.212

<b>Dam</b>	<b>Annual</b>	<b>Spring</b>	<b>Summer</b>	<b>Fall</b>	<b>Winter</b>
Vallecito	0.108	0.412	0.120	<b>0.046</b>	1.000
Willow Creek (MT)	0.591	0.707	0.580	<b>0.006</b>	0.193
Arthur V Watkins	0.475	0.074	0.412	0.164	0.134
Blue Mesa	0.059	0.830	0.087	<b>0.030</b>	0.187
Fontenelle	0.915	0.972	0.269	0.887	<b>0.020</b>
Paonia	<b>0.015</b>	0.164	0.412	<b>0.003</b>	<b>0.038</b>
Ridgway	0.059	0.199	0.187	<b>0.008</b>	<b>0.005</b>
Silver Jack	<b>0.002</b>	0.568	0.143	<b>0.003</b>	<b>0.050</b>
Folsom	0.074	0.187	0.382	<b>0.022</b>	<b>0.014</b>
Monticello	<b>0.020</b>	0.239	<b>0.030</b>	0.464	<b>0.001</b>
Bradbury	<b>0.001</b>	<b>0.007</b>	<b>0.000</b>	0.643	<b>0.030</b>
Friant	<b>0.020</b>	<b>0.014</b>	1.000	0.074	0.143
Whiskeytown	<b>0.014</b>	<b>0.014</b>	<b>0.046</b>	0.164	0.164
Spring Creek	<b>0.049</b>	0.276	<b>0.035</b>	0.134	0.225
New Melones	<b>0.035</b>	0.069	<b>0.006</b>	<b>0.007</b>	0.080
Trinity	<b>0.011</b>	<b>0.027</b>	<b>0.000</b>	0.943	<b>0.014</b>
Shasta	<b>0.001</b>	<b>0.017</b>	<b>0.000</b>	<b>0.001</b>	<b>0.000</b>

Table S3. *p*-values of the monotonic trend analyses of high inflow for maximum and seasonal timescales in the study dams for the period of 1993-2022 (significance level = 0.05). Statistically significant values are highlighted in bold.

Dam	Annual	Spring	Summer	Fall	Winter
Buffalo Bill	0.318	0.643	0.143	0.134	0.187
Yellowtail	0.254	0.454	0.318	0.943	0.695
Big Sandy	0.101	0.080	0.943	1.000	0.129
Bull	0.748	0.301	0.354	0.617	0.887
Boysen	0.498	0.475	0.432	0.592	0.775
Causey	<b>0.046</b>	<b>0.025</b>	0.143	<b>0.000</b>	<b>0.000</b>
Clark Canyon	0.354	0.392	0.721	0.187	0.318
Currant Creek	0.887	0.187	0.972	0.269	<b>0.046</b>
Deer Creek	0.284	<b>0.017</b>	0.116	0.239	0.915
East Canyon	<b>0.022</b>	<b>0.020</b>	<b>0.042</b>	<b>0.046</b>	0.301
Flaming Gorge	0.695	0.544	0.972	0.803	0.643
Jordanelle	<b>0.032</b>	0.695	<b>0.001</b>	0.354	0.069
Huntington North	0.669	0.225	0.454	<b>0.012</b>	0.361
Jackson Gulch	0.080	<b>0.017</b>	0.354	<b>0.000</b>	<b>0.018</b>
Joes Valley	0.521	0.059	0.943	0.392	<b>0.020</b>
Powell Glen Canyon	0.125	<b>0.011</b>	0.301	0.074	0.153
Lemon	0.064	<b>0.003</b>	0.335	0.108	0.643
Tiber	0.721	1.000	0.521	0.475	0.239
Lost Creek	<b>0.046</b>	0.069	0.087	<b>0.001</b>	0.087
Mcphee	<b>0.014</b>	<b>0.007</b>	0.284	0.059	0.643
Meeks Cabin	0.354	0.175	0.858	0.568	<b>0.000</b>
Moon	0.392	0.721	0.803	0.887	0.069
Navajo	0.074	0.087	0.254	0.054	0.335
Newton	<b>0.017</b>	0.212	<b>0.050</b>	0.682	0.059
Red Fleet	<b>0.020</b>	<b>0.007</b>	<b>0.027</b>	0.153	0.225
Wanship	<b>0.015</b>	<b>0.007</b>	<b>0.032</b>	<b>0.000</b>	0.432
Scotfield	0.087	<b>0.022</b>	0.225	0.412	0.669
Sherburne	0.568	0.972	0.354	0.432	0.269
Starvation	0.080	0.212	0.803	0.412	0.153
Stateline	0.521	0.617	0.669	0.153	<b>0.002</b>
Steinaker	0.972	0.116	0.887	<b>0.032</b>	<b>0.001</b>
Soldier Creek	0.335	0.143	0.669	<b>0.027</b>	0.568
Taylor Park	0.239	<b>0.027</b>	0.568	0.116	0.682
Upper Stillwater	0.372	0.269	0.475	1.000	0.239

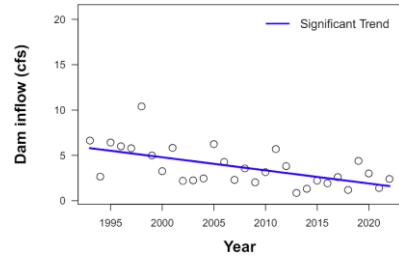
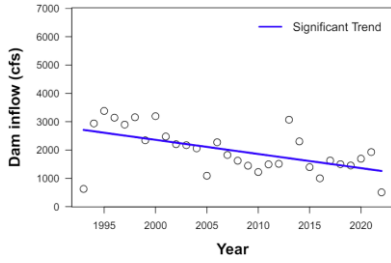
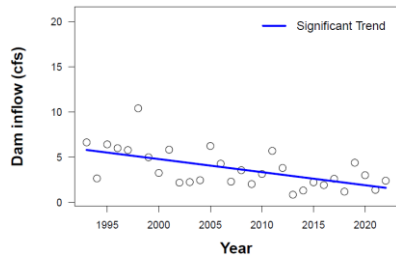
<b>Dam</b>	<b>Annual</b>	<b>Spring</b>	<b>Summer</b>	<b>Fall</b>	<b>Winter</b>
Vallecito	0.125	<b>0.007</b>	0.392	0.087	0.077
Willow Creek (MT)	0.887	0.972	0.643	<b>0.008</b>	<b>0.037</b>
Arthur V Watkins	0.059	0.212	0.498	0.087	<b>0.038</b>
Blue Mesa	0.164	<b>0.015</b>	0.284	<b>0.019</b>	0.175
Fontenelle	0.721	0.544	0.225	0.775	0.094
Paonia	<b>0.022</b>	<b>0.004</b>	0.212	<b>0.017</b>	0.094
Ridgway	0.125	<b>0.009</b>	0.568	<b>0.001</b>	0.094
Silver Jack	0.498	<b>0.046</b>	0.199	<b>0.007</b>	<b>0.046</b>
Folsom	0.153	0.568	0.101	0.199	<b>0.012</b>
Monticello	<b>0.020</b>	0.498	<b>0.002</b>	0.164	<b>0.001</b>
Bradbury	<b>0.009</b>	<b>0.011</b>	<b>0.000</b>	0.669	<b>0.005</b>
Friant	0.101	0.108	0.775	0.521	0.080
Whiskeytown	<b>0.011</b>	<b>0.020</b>	<b>0.017</b>	<b>0.004</b>	<b>0.020</b>
Spring Creek	0.059	0.269	0.125	0.382	<b>0.014</b>
New Melones	0.064	0.074	<b>0.022</b>	0.143	<b>0.012</b>
Trinity	<b>0.012</b>	0.074	<b>0.012</b>	0.669	<b>0.008</b>
Shasta	<b>0.009</b>	0.254	<b>0.000</b>	0.101	<b>0.000</b>

Table S4. Results of trend analyses of low/median/high inflow for maximum and seasonal timescales in the study dams for the period of 1993-2022 (significance level of 0.05). Statistically significant upward and downward trends are denoted as “Up” and “Down” with highlighted in bold. "Inconsistent" indicates monotonic trend that has been changed due to non-monotonic trends.

Dam	Annual			Spring			Summer			Fall			Winter		
	Low	Median	High	Low	Median	High	Low	Median	High	Low	Median	High	Low	Median	High
Buffalo Bill	No	Up	No	No	No	No	No	No	No	No	No	No	No	No	No
Yellowtail	No	No	No	No	No	No	No	No	No	Up	No	No	Up	No	No
Big Sandy	No	No	No	No	No	No	No	No	No	No	No	No	No	Down	No
Bull	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Boysen	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Causey	Down	Down	Down	Down	No	Down	Down	Down	No	Down	Down	Down	Inconsistent	Down	Down
Clark Canyon	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Currant Creek	No	No	No	No	No	No	No	No	No	Down	No	No	Inconsistent	No	Up
Deer Creek	No	No	No	No	No	Down	No	No	No	No	No	No	No	No	No
East Canyon	No	No	Down	No	No	Down	No	No	Down	No	No	Down	No	No	No
Flaming Gorge	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Jordanelle	Inconsistent	Up	Inconsistent	Up	No	No	Inconsistent	Up	Up	Up	No	No	Up	No	No
Huntington North	Down	No	No	No	No	No	No	No	No	Inconsistent	No	Down	Down	Inconsistent	No
Jackson Gulch	Down	Inconsistent	No	No	Down	Down	No	Down	No	No	Down	Down	Inconsistent	Down	Inconsistent
Joes Valley	No	Down	No	No	No	No	No	No	No	No	No	No	No	No	Down
Powell Glen Canyon	No	Down	No	Down	Down	Down	No	No	No	No	Down	No	No	No	No
Lemon	No	No	No	No	No	Inconsistent	No	No	No	No	No	No	No	No	No
Tiber	No	No	No	No	No	No	Down	No	No	No	No	No	No	No	No
Lost Creek	No	Down	Down	No	No	No	No	Down	No	No	Down	Down	Down	Down	No
Mcphee	Down	Down	Down	No	Down	Down	No	No	No	No	No	No	No	No	No
Meeks Cabin	No	No	No	No	No	No	No	No	No	No	No	No	No	Up	Inconsistent
Moon	No	No	No	No	Up	No	Down	No	No	Down	No	No	No	No	No
Navajo	No	Down	No	No	No	No	No	No	No	No	Down	No	No	No	No
Newton	No	No	Inconsistent	No	No	No	No	No	Down	No	No	No	No	No	No
Red Fleet	Down	Down	Down	Down	No	Down	Down	Inconsistent	Down	Down	Down	No	No	Down	No
Wanship	Down	Down	Down	No	Down	Down	No	Down	Down	Down	Down	Down	No	No	No
Scofield	No	No	No	No	No	Down	No	No	No	No	No	No	No	No	No
Sherburne	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Starvation	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Stateline	No	No	No	No	No	No	No	No	No	No	No	No	Down	Down	Down
Steinaker	No	Down	No	No	Down	No	Down	No	No	Up	No	Down	No	No	Up
Soldier Creek	No	No	No	Down	No	No	No	No	No	No	No	Up	No	No	No
Taylor Park	No	No	No	No	No	Down	No	No	No	No	No	No	No	No	No
Upper Stillwater	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Vallecito	No	No	No	No	No	Down	No	No	No	No	Down	No	No	No	No
Willow Creek (MT)	No	No	No	No	No	No	No	No	No	No	Inconsistent	Up	No	No	Down
Arthur V Watkins	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Down
Blue Mesa	No	No	No	No	No	Down	No	No	No	No	Down	Down	No	No	No
Fontenelle	No	No	No	No	No	No	No	No	No	No	No	No	Down	Down	No



Paonia	No	Down	Down	No	No	Down	Down	No	No	Down	Down	Down	No	Down	No
Ridgway	No	No	No	No	No	Down	No	No	No	Down	Down	Down	No	Down	No
Silver Jack	Down	Down	No	Down	No	Inconsistent	No	No	No	No	Down	Down	No	Down	Down
Folsom	Down	No	No	Down	No	No	No	No	No	Down	No	No	No	Down	Down
Monticello	No	Down	Down	No	No	No	No	Down	Inconsistent	No	No	No	Down	Inconsistent	Inconsistent
Bradbury	Down	Inconsistent	Down	Inconsistent	Inconsistent	Inconsistent	Down	Down	Down	No	No	No	Down	Down	Down
Friant	Down	Down	No	Down	Down	No	No	No	No	No	No	No	No	No	No
Whiskeytown	No	Down	Down	Down	Down	Down	No	Down	Inconsistent	No	No	Down	No	No	Down
Spring Creek	No	Down	No	No	No	No	No	Down	No	No	No	No	No	No	Down
New Melones	No	Down	No	Down	No	No	Down	Inconsistent	Down	No	Down	No	No	No	Down
Trinity	No	Down	Down	Down	Down	No	Down	Down	Down	No	No	No	No	Down	Down
Shasta	Down	Down	Down	Down	Down	No	No	No	No	No	Down	No	No	No	No



(a) Annual low inflow timeseries with a statistically significant trend at Bradbury Dam

(b) Summer median inflow timeseries with a statistically significant trend at Whiskeytown Dam

(c) Fall high inflow timeseries with a statistically significant trend at Lost Creek Dam

Figure S1. Time series of dam inflows with significant trends. Bradbury Dam, Whiskeytown Dam, and Lost Creek Dam were chosen based on the lowest  $p$ -value for low, median and high inflows, respectively.