.

Appendix 3-A
Water Year Type Classification for Petaluma Valley, Santa Rosa Plain, and Sonoma Valley

Water Year Type Classification for Petaluma Valley, Santa Rosa Plain, and Sonoma Valley

Monthly PRISM precipitation records from each basin were combined to create a single precipitation record. The 3 locations are

PRISM Location	Groundwater Basin	Representative Station
38.5068,-122.8029	Santa Rosa Plain	Santa Rosa Airport
38.2473,-122.6250	Petaluma Valley	Petaluma Airport
38.2992,-122.4553	Sonoma Valley	Vallejo House

These three records were first averaged for each water year. These are shown in Figure 1 for the period from 1895 to January 2020. The precipitation records for the 3 basins are highly correlated (Figure 2). This means aggregation of the 3 records will not introduce biases into the synthesized record. It also means that a single site could also be used as a surrogate for all 3. This approach does not account for the original biases that exist within the original datasets. These biases may exist because PRISM monthly estimates do not match actual recorded values for a given station.

A rolling weighted average was applied to the combined yearly precipitation record. This is done because groundwater recharge has a latency to precipitation, infiltration and other processes. We used a 3 year rolling window. Figure 3 shows the filtered signal using the same filter that is applied to the water year records. The filter applies weights so that the current year has the most effect on the moving average, and the two previous have lesser effects.

To classify water years in to hydrologic types, the following percentile classifications were applied. These values are based on the percentiles of the entire record and were used to classify the 3-year rolling average values (Table 1).

Table 2 Shows the number of water types based on this classification. The combined precipitation record, water year types, and rolling average is shown if Figure 4.

Percentile of Entire Record	Water Year Type	Lower Bound (inches)	Upper Bound (inches)
0 - 20%	Very Dry	11.2	18.5
20- 40%	Dry	18.5	22.7
40-60%	Normal	22.7	32.3
60-80%	Wet	32.3	41.5
80-100%	Very Wet	41.5	56.1

Percentile of Entire Record	Water Year Type	Number of Water Year Types
0 - 10%	Very Dry	4
10- 30%	Dry	20
30-70%	Normal	65
70-90%	Wet	34
90-100%	Very Wet	2

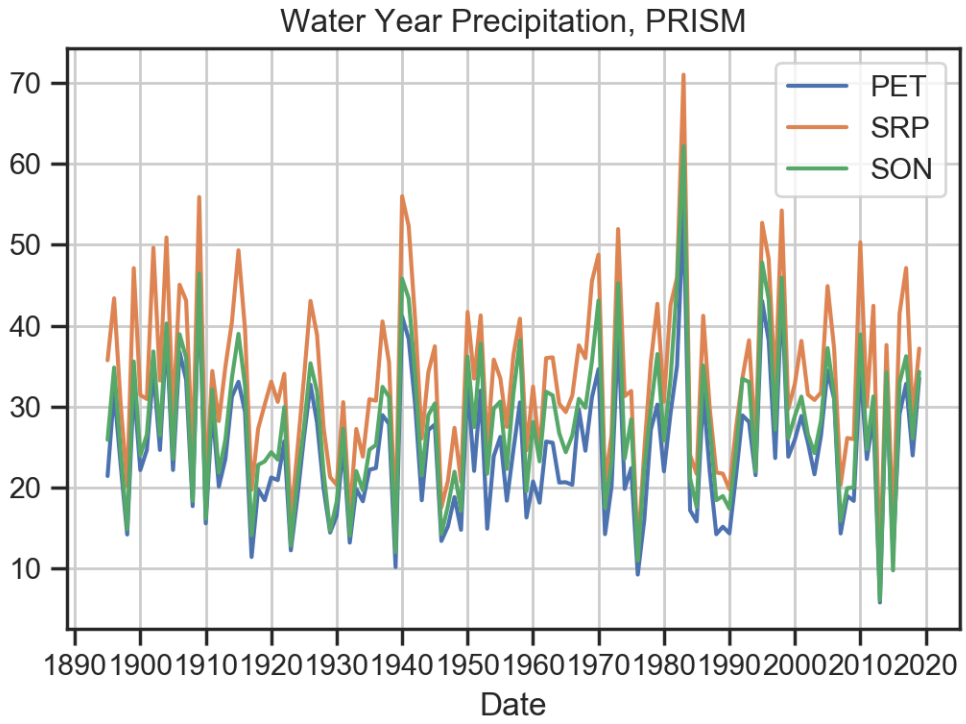

Figure 1 Water year precipitation for each basin

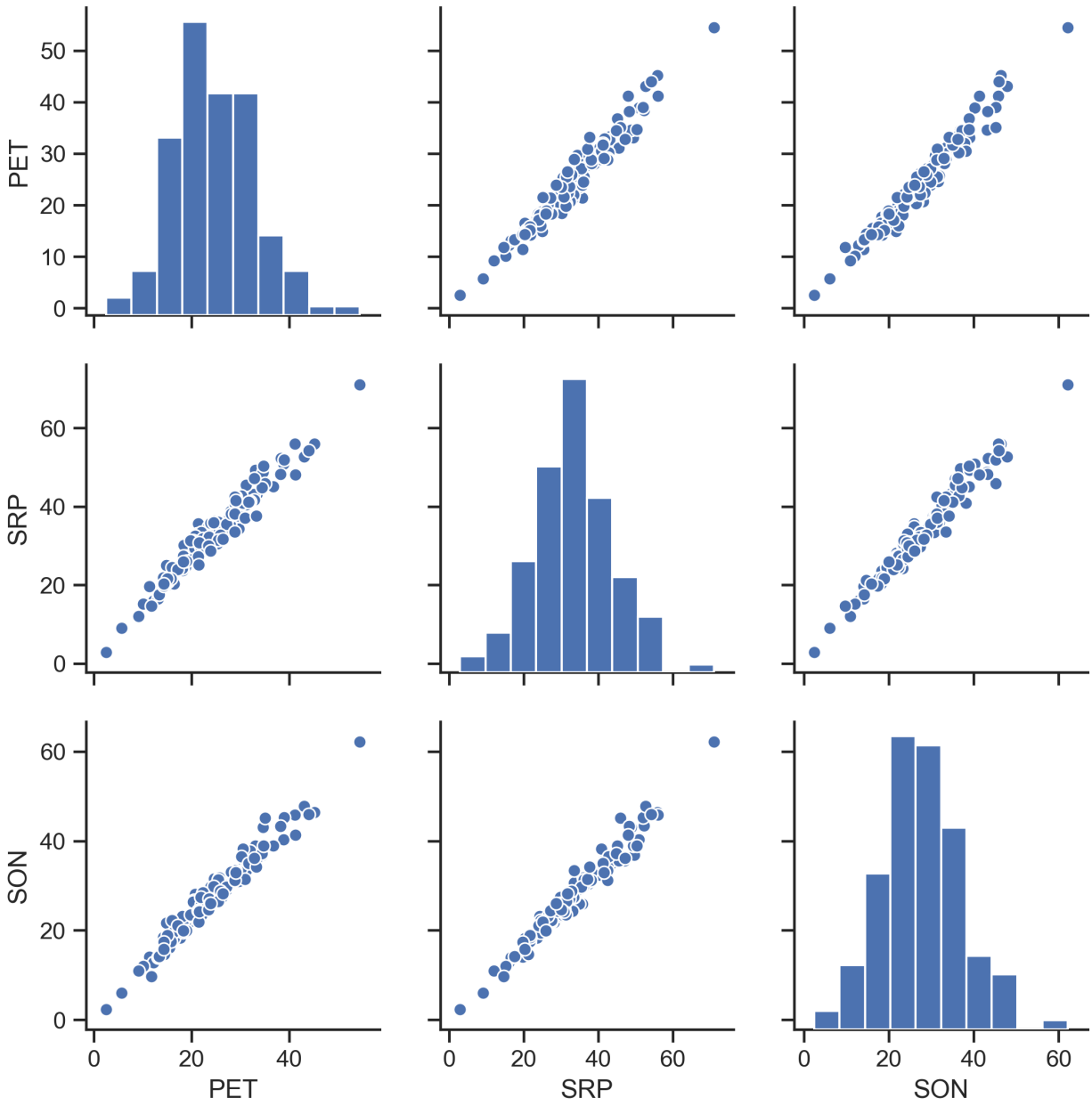

Figure 2 pairwise relationships for the 3 subbasin records

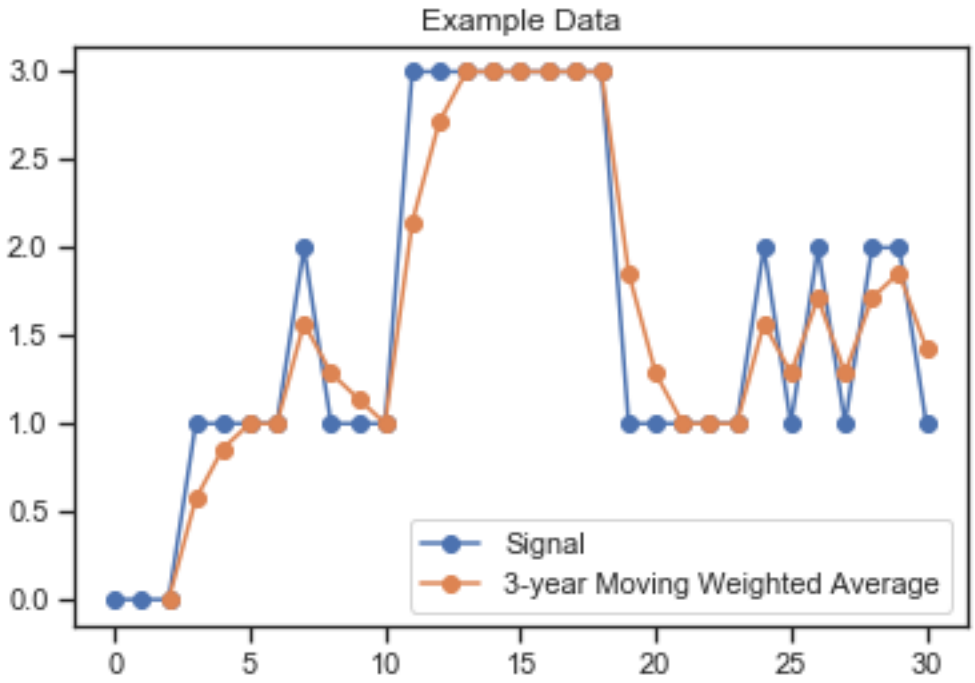

Figure 3 Example data showing signal and filtered response timeseries

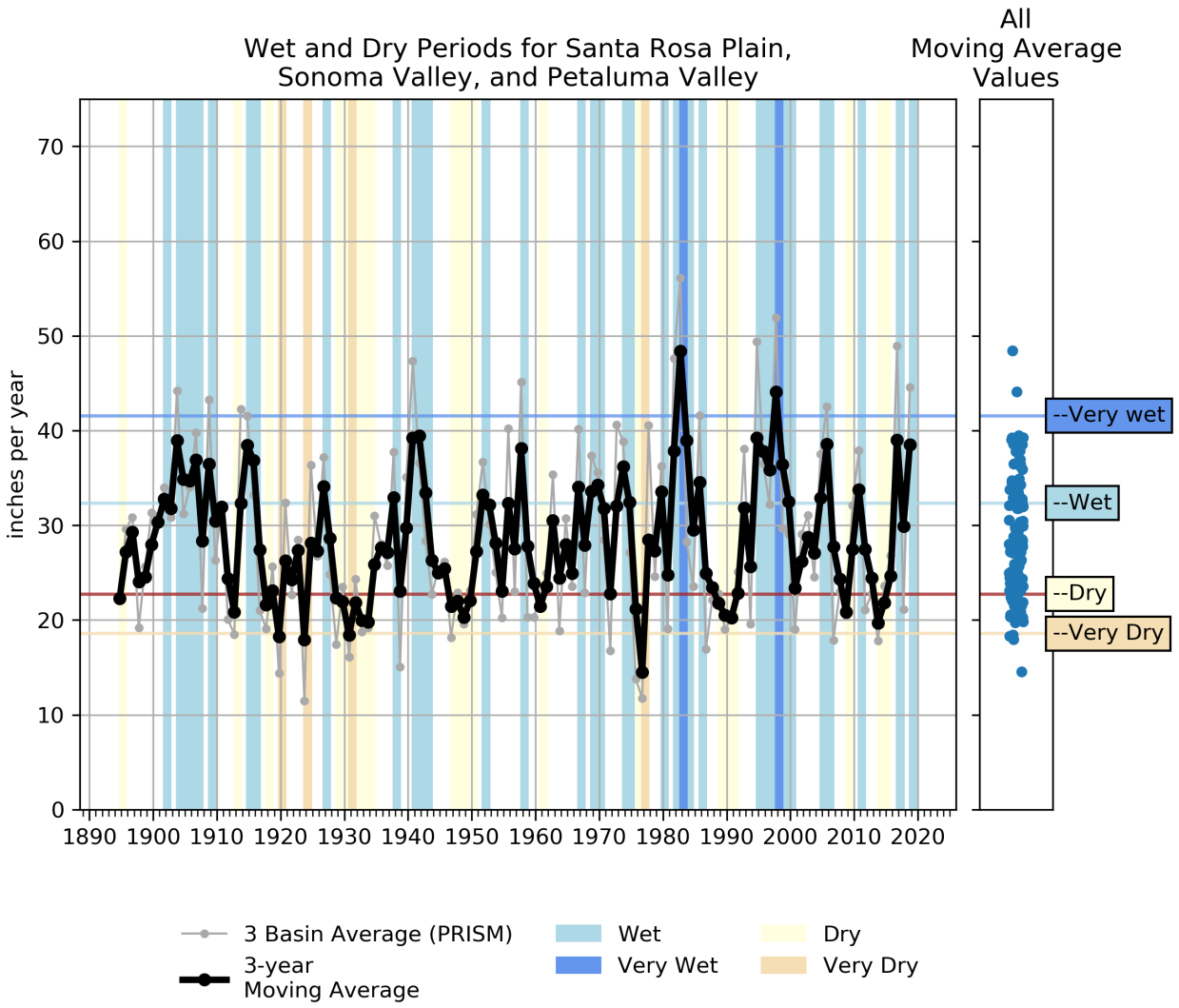

Figure 4 Water Classifications for Santa Rosa Plain, Sonoma Valley, and Petaluma Valley