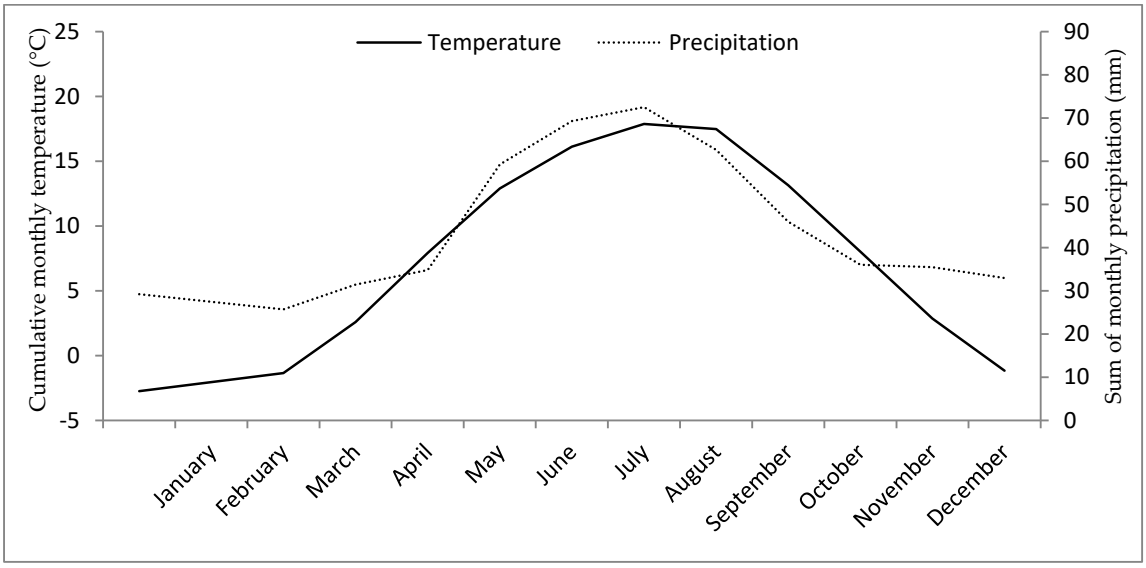
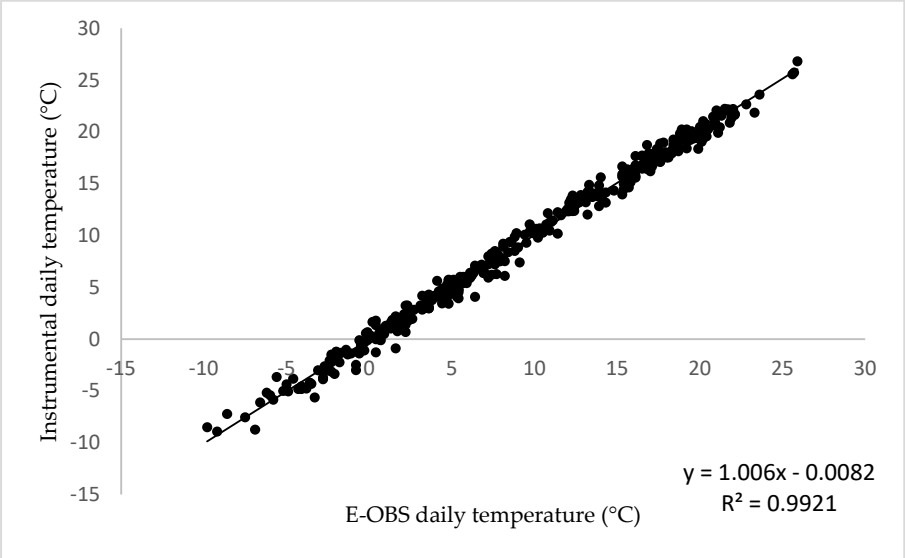


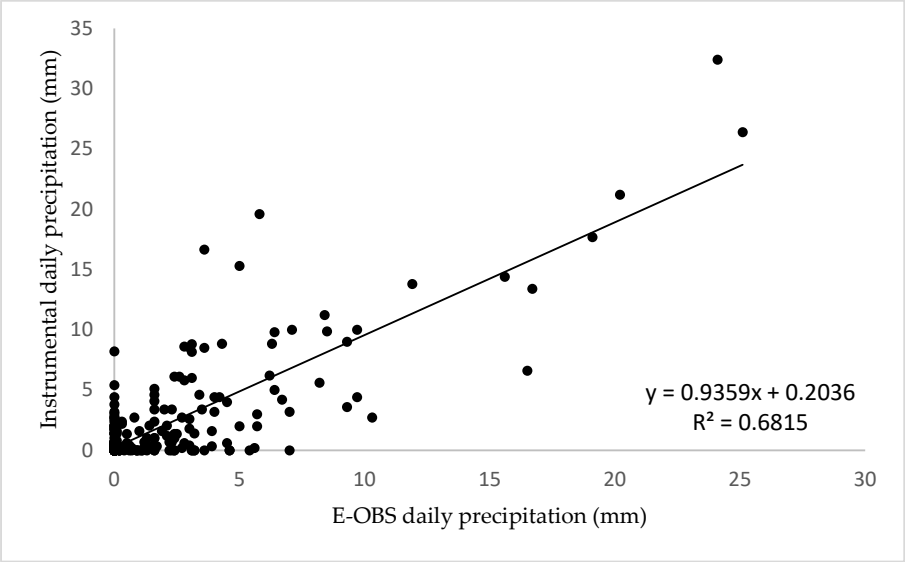
Supplementary Figure S1: The E-OBS Ombrothermic chart for the region 1950-2018.

Supplementary Table S1: Measured water balance components.

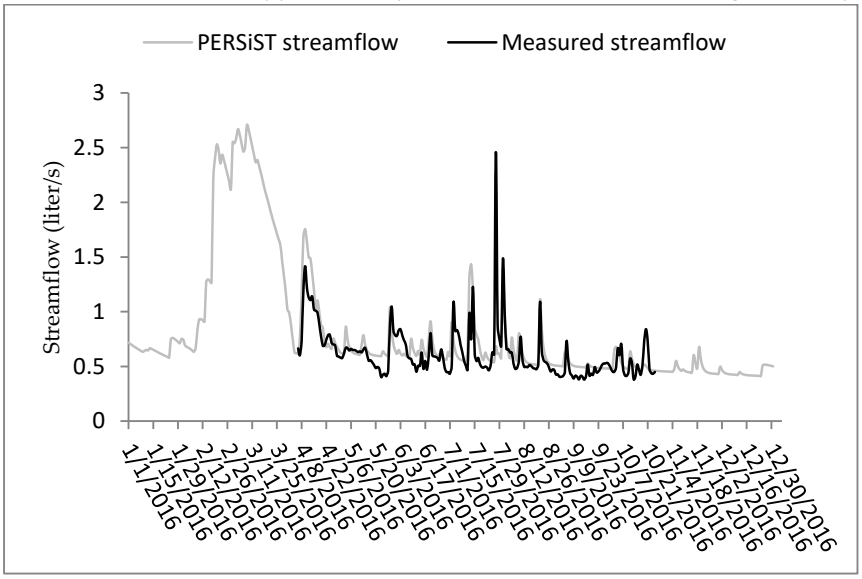
Water balance for the 2016 growing season (6.4.-25.10.)	**Total**	**Precipitation during the period**	**Percent of precipitation**
Total measured runoff (mm)	26.5	377	7%
Total measured transpiration for conifers (mm)	161.3	377	43%
Total measured transpiration for deciduous (mm)	238.3	377	63%
Total area weighted transpiration for both stand types (mm)	216.0	377	57%



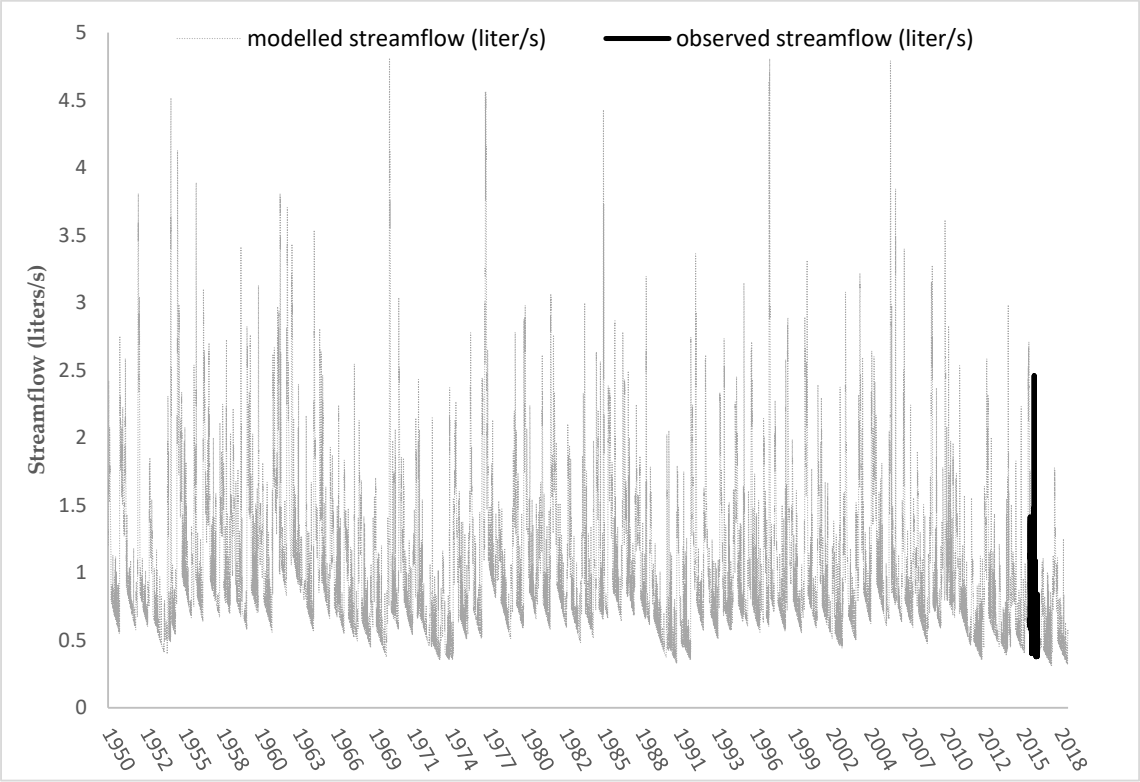
Supplementary Figure S2: Comparison between temperature in E-OBS and instrumental measurements



Supplementary Figure S3: Monthly precipitation comparison between E-OBS and instrumental – the one main difference happens in July with one storm event not registered by the E-OBS



Supplementary Figure S4: Calibration Time Series: PERSiST (grey) is able to reproduce the observed (black) timing of peaks and seasonal recession. Most of the inaccuracy comes in the form of one large observed peak in July which occurred at a time when the gridded input data did not have a large storm event, thus it was not simulated by the model. The accuracy of the model can be described as follows, R^2: 0.446, N-S: 0.403, RMSE: 29.5, N: 203



Supplementary Figure S5: Long term PERSiST runoff simulation (dotted grey line) and observed runoff (full black line). It is important to note that there was a major drought in 1953, which is captured by the simulations.

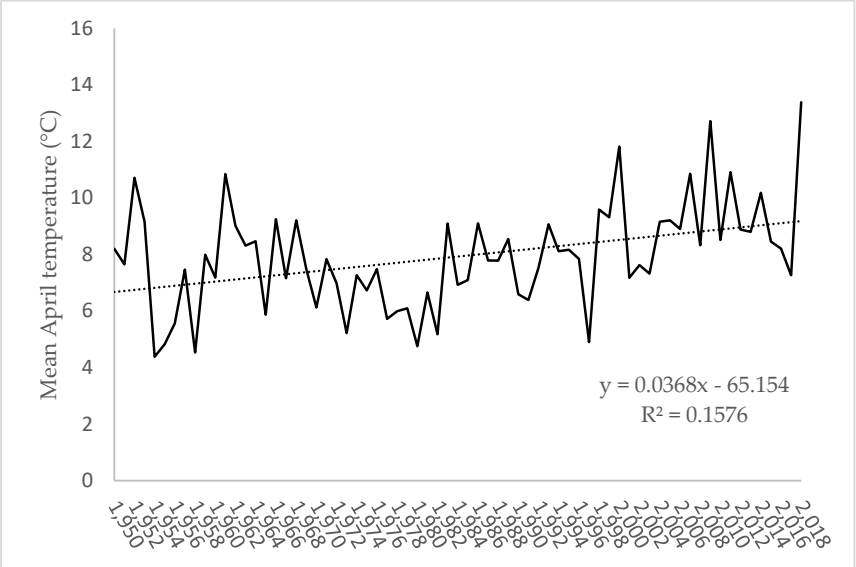
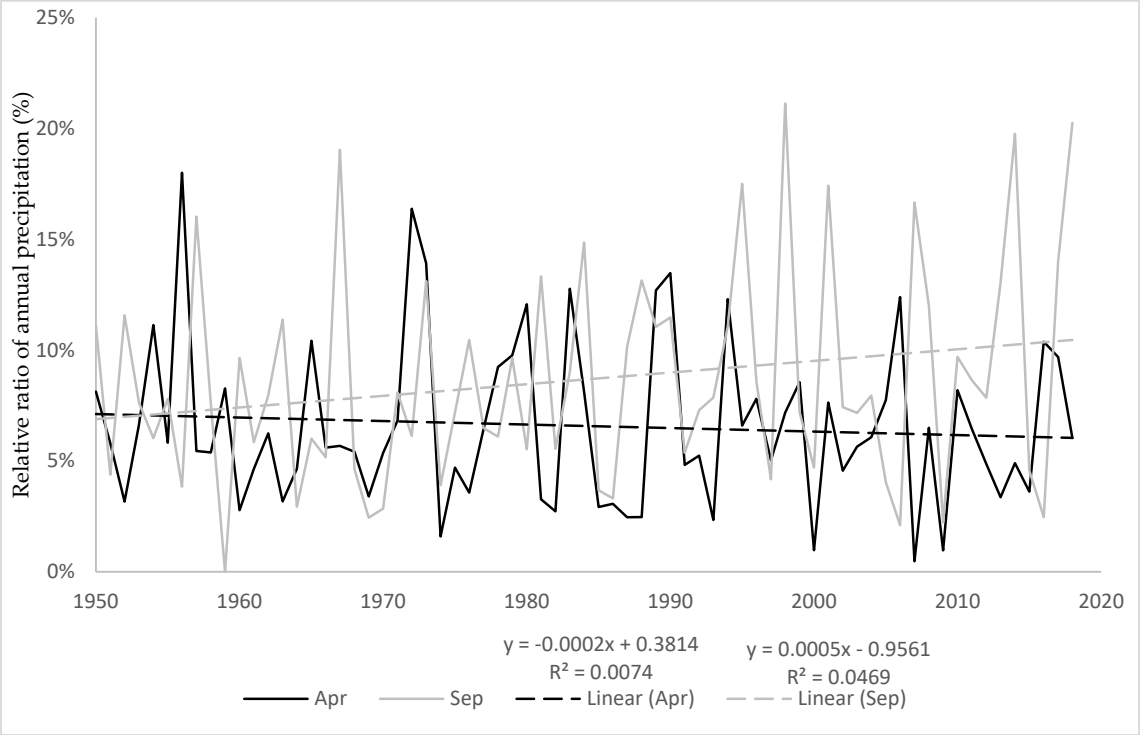


Figure S6: The E-OBS temperature data. Mean daily temperature in April where a significant trend was found is shown.



Supplementary Figure S7: The E-OBS precipitation data. The relative ratio of annual precipitation happening during individual months. Only the relevant months (April and September) where a significant trend was found are shown.

Supplementary Table S2. Linear trends in annual modelled water balance components since 1990 as obtained from the regression lines.

Water balance component	**Y (mm/day)**	**Y (mm/year)**	**R^2**	**Long-term average 1990-2018**	**Relative annual difference to long-term average**
ET Deciduous	0.00137	0.50	0.0042	454.8	0.11%
ET Coniferous	0.00054	0.20	0.0009	463.8	0.04%
Precipitation	-0.00207	-0.76	0.0075	530.2	-0.14%
Runoff	-0.0019	-0.69	0.1304	73.6	-0.94%