Gaining Hydrological Insights Through Wilk's Feature Importance: A Test-Statistic Interpretation method for Reliable and Robust Inference

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Introduction

Figures S1 to S2 indicate the iterative reduction in predictive accuracy (RMSE and adjusted R^2) for the training and validation datasets. Figures S3 to S7 show the Spearman's ρ values of the most significant predictors from all the considered models. Figure S8 shows the posterior-informed importance scores at different flow quantile intervals for the Winter irrigation periods. Figure S9 to S13 show the BMA weights of SCE decision trees under seven flow quantile intervals.

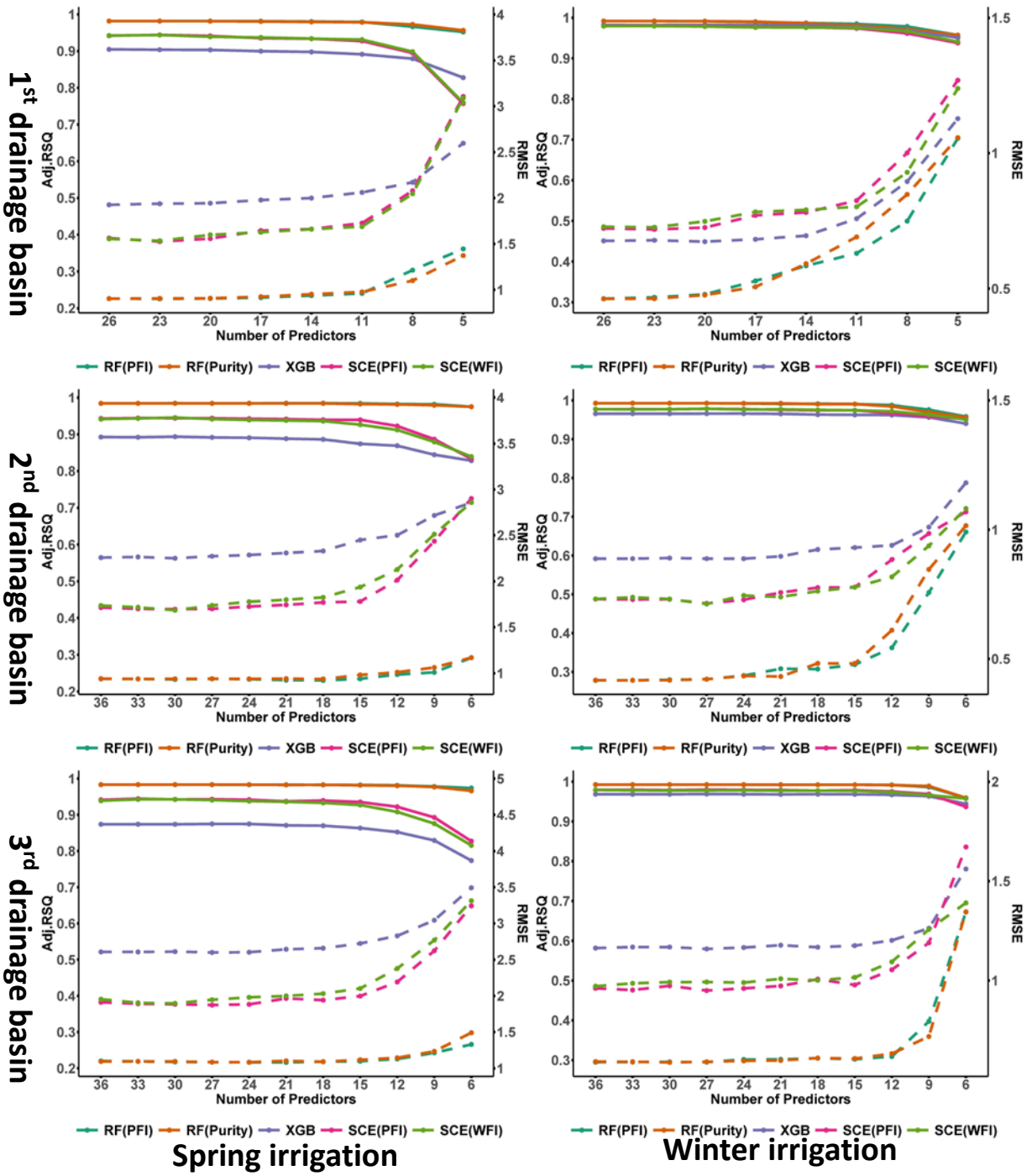

Figure S1: Iterative reduction in accuracy for the training dataset. Note: The solid lines indicate adjusted R^2, while the dashed lines represent RMSE.

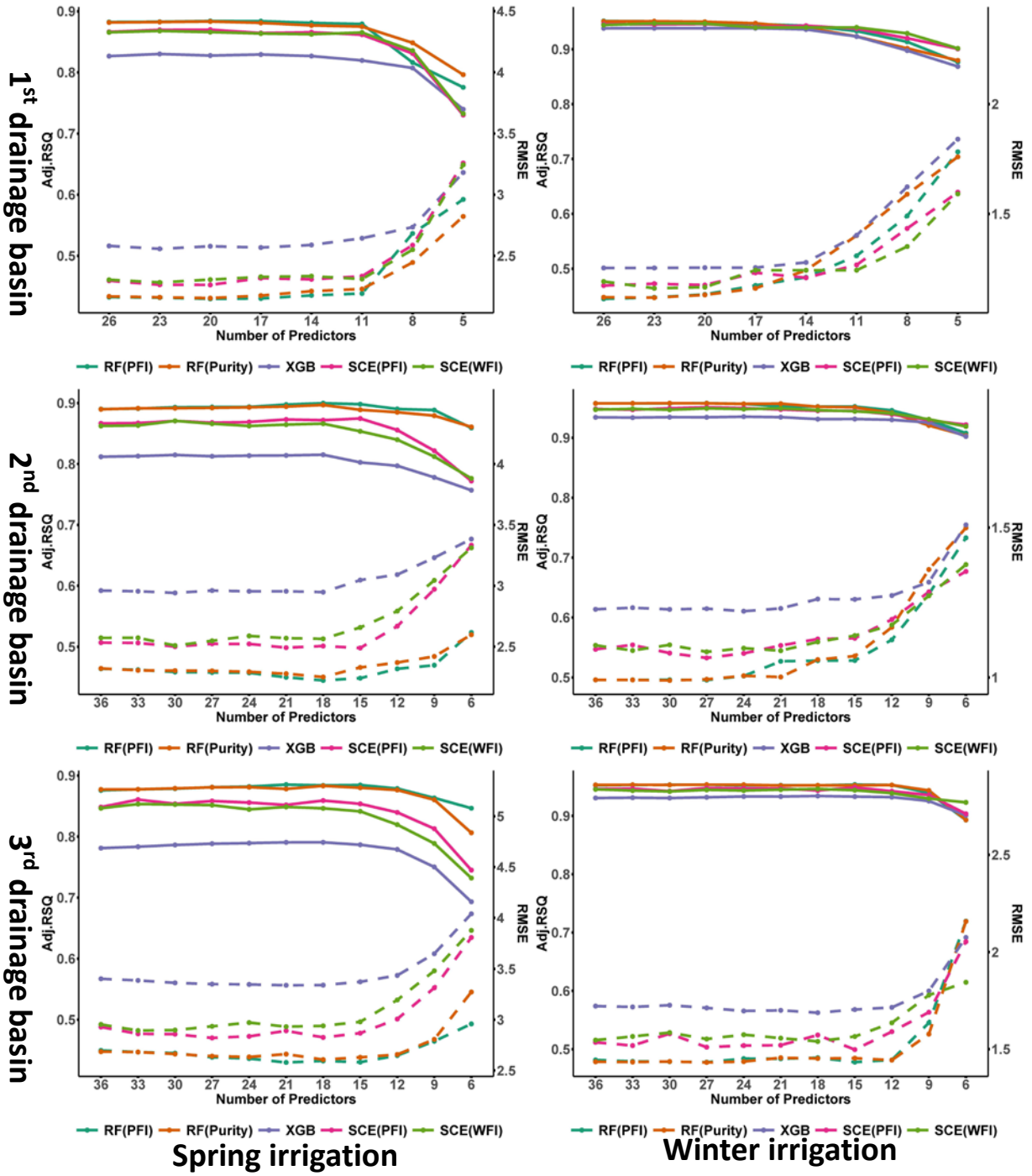

Figure S2: Iterative reduction in accuracy for the validation dataset. Note: The solid lines indicate adjusted R^2, while the dashed lines represent RMSE.

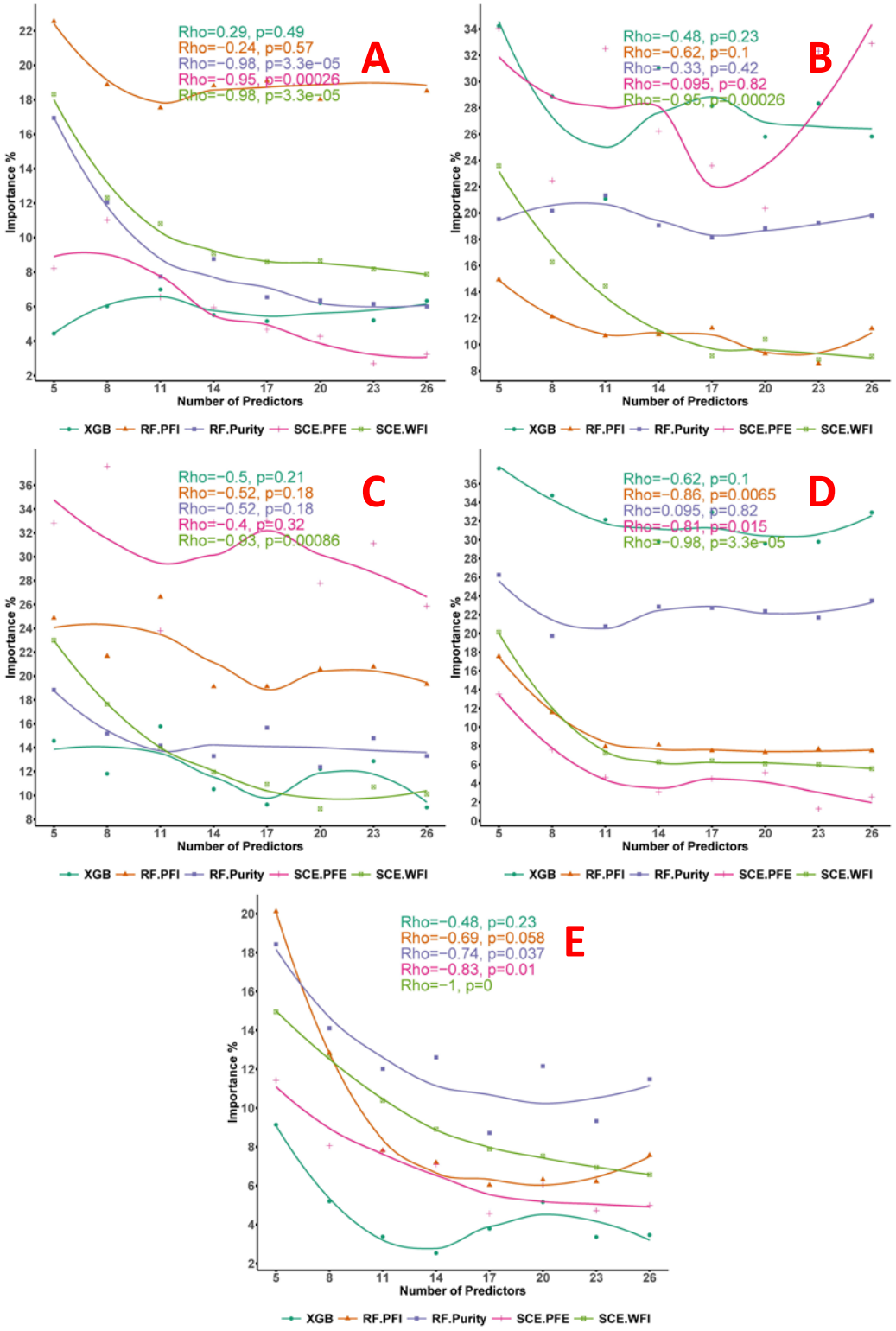

Figure S3: Spearman's ρ values for the first drainage basin during the Winter irrigation period. The p-value means how likely it is that the observed correlation is due to chance. Small p-values

indicate strong evidence for the observed correlations. Capital letters from A to E represent the five most relevant features identified by different models.

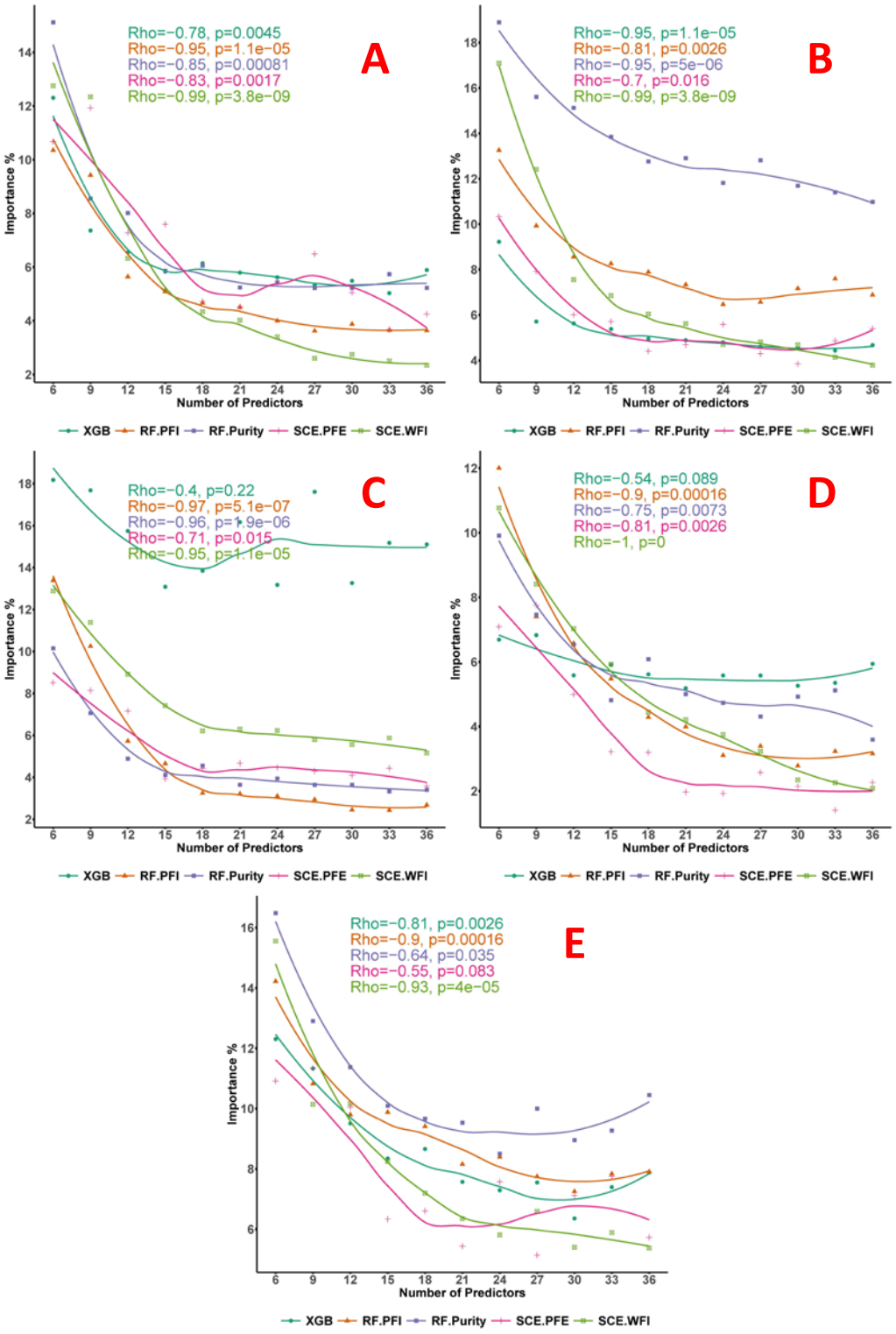

Figure S4: Spearman's ρ values for the second drainage basin during the Spring irrigation period. The p-value means how likely it is that the observed correlation is due to chance. Small p-values indicate strong evidence for the observed correlations. Capital letters from A to E represent the five most relevant features identified by different models.

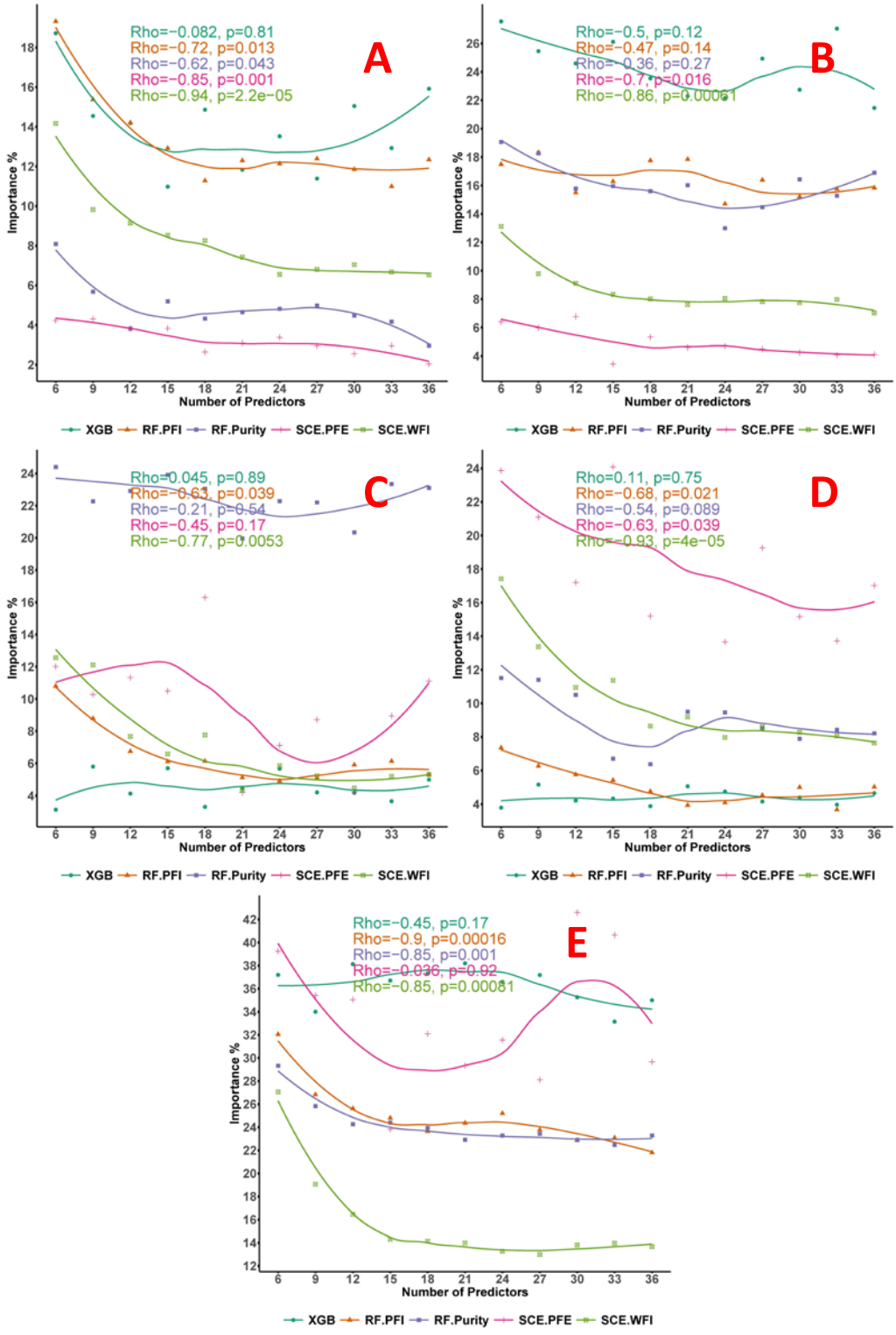

Figure S5: Spearman's ρ values for the second drainage basin during the Winter irrigation period. The p-value means how likely it is that the observed correlation is due to chance. Small

p-values indicate strong evidence for the observed correlations. Capital letters from A to E represent the five most relevant features identified by different models.

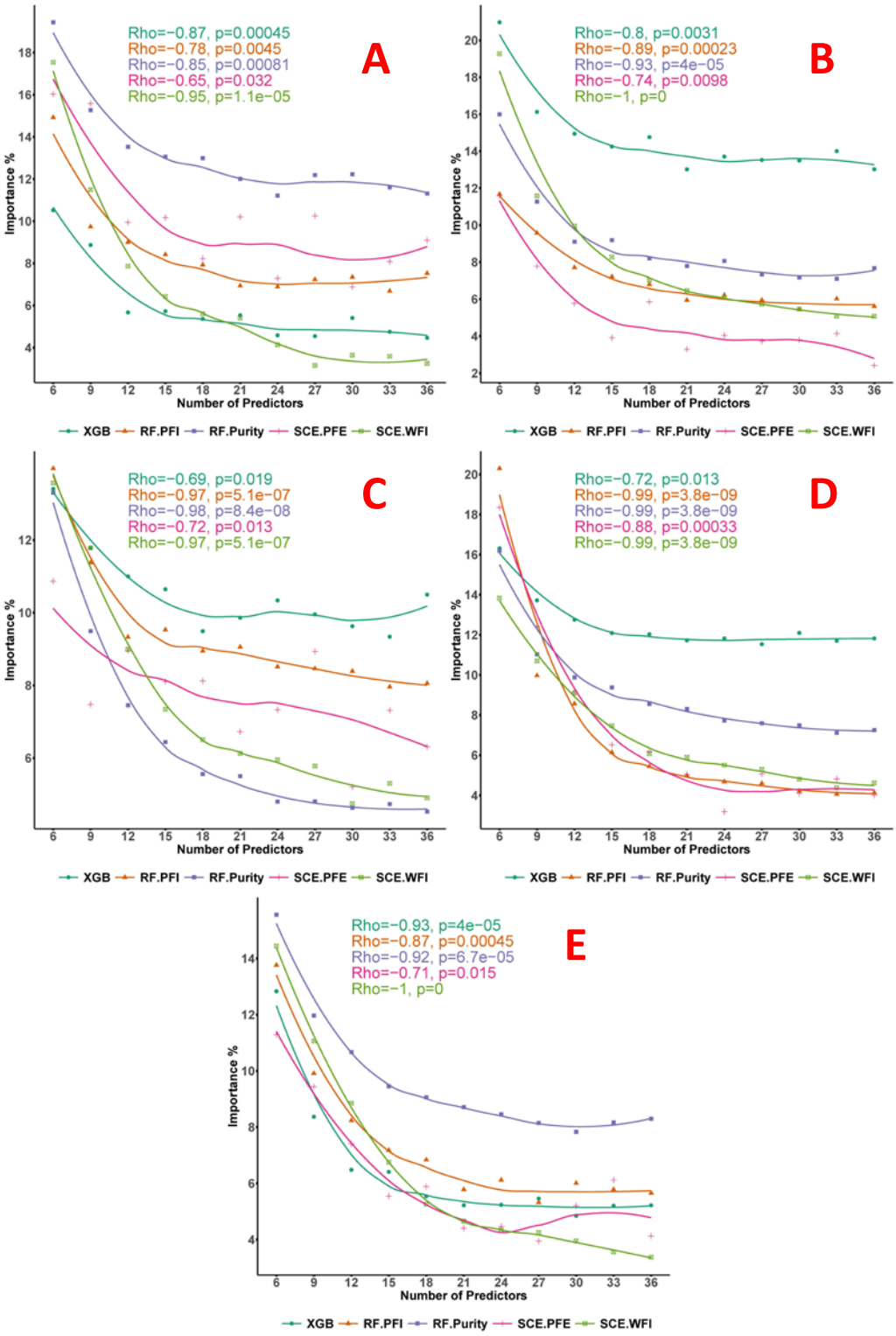

Figure S6: Spearman's ρ values for the third drainage basin during the Spring irrigation period. The p-value means how likely it is that the observed correlation is due to chance. Small p-values indicate strong evidence for the observed correlations. Capital letters from A to E represent the five most relevant features identified by different models.

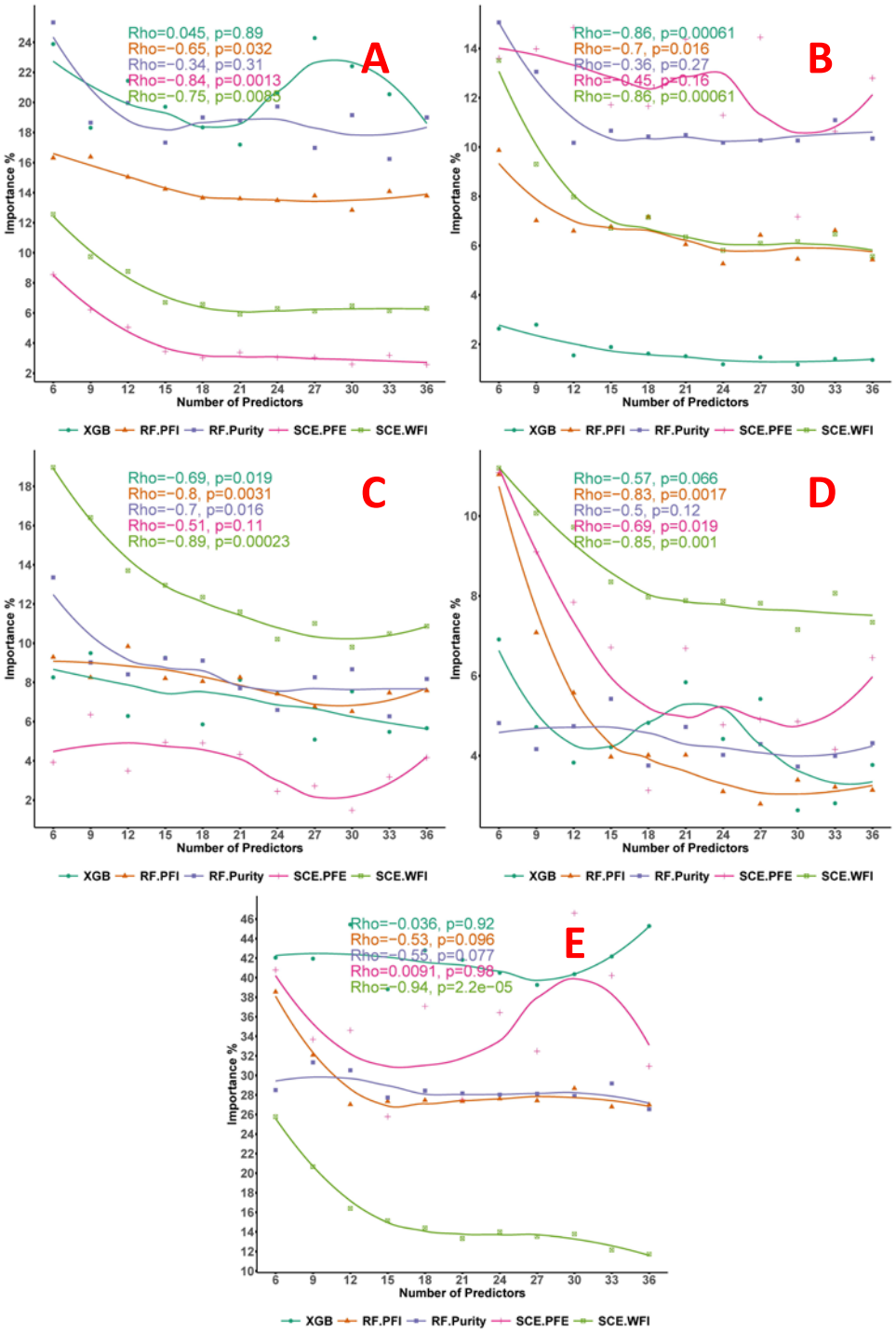

Figure S7: Spearman's ρ values for the third drainage basin during the Winter irrigation period. The p-value means how likely it is that the observed correlation is due to chance. Small p-values indicate strong evidence for the observed correlations. Capital letters from A to E represent the five most relevant features identified by different models.

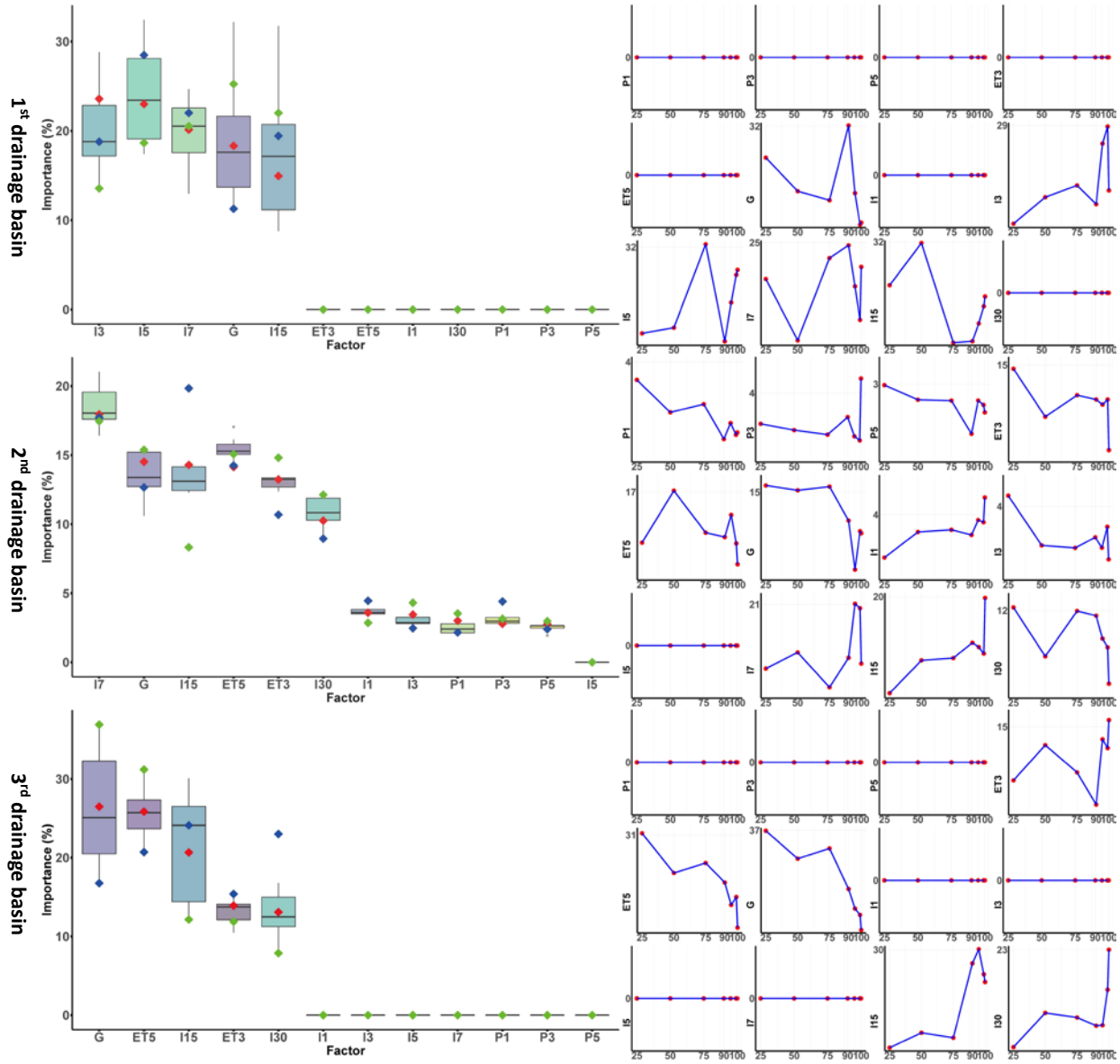

Figure S8: Posterior-informed importance scores at different flow quantile intervals for the Winter irrigation period. Note: the importance scores at different quantile intervals are represented as box and whisker plots, the mean feature importance (measured using normal WFI method) is represented as red diamonds. The green and blue diamonds are feature importance at 25th and 100th flow quantiles, respectively. The line plots on the right side represent how importance scores vary

along with the changes in flow quantile. The “x” and “y” axis of the line plots are flow quantiles at 25, 50, 75, 95, 95, 99 and 100 (%), and feature importance (%), respectively.

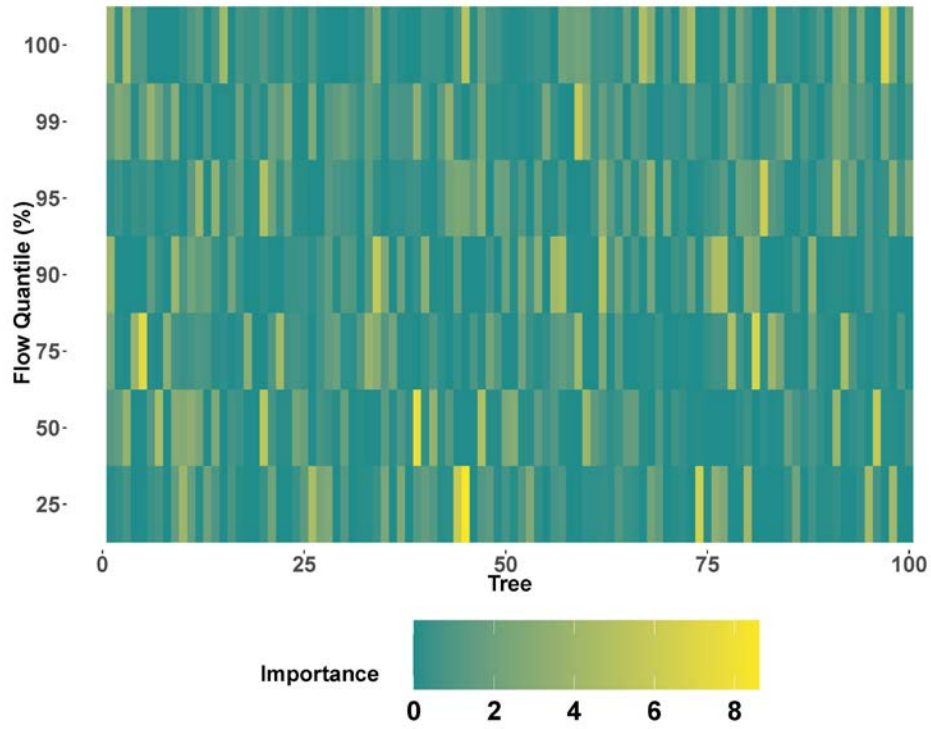

Figure S9: BMA weights of SCE decision trees for the first drainage basin at the Winter irrigation period under seven flow quantile ranges.

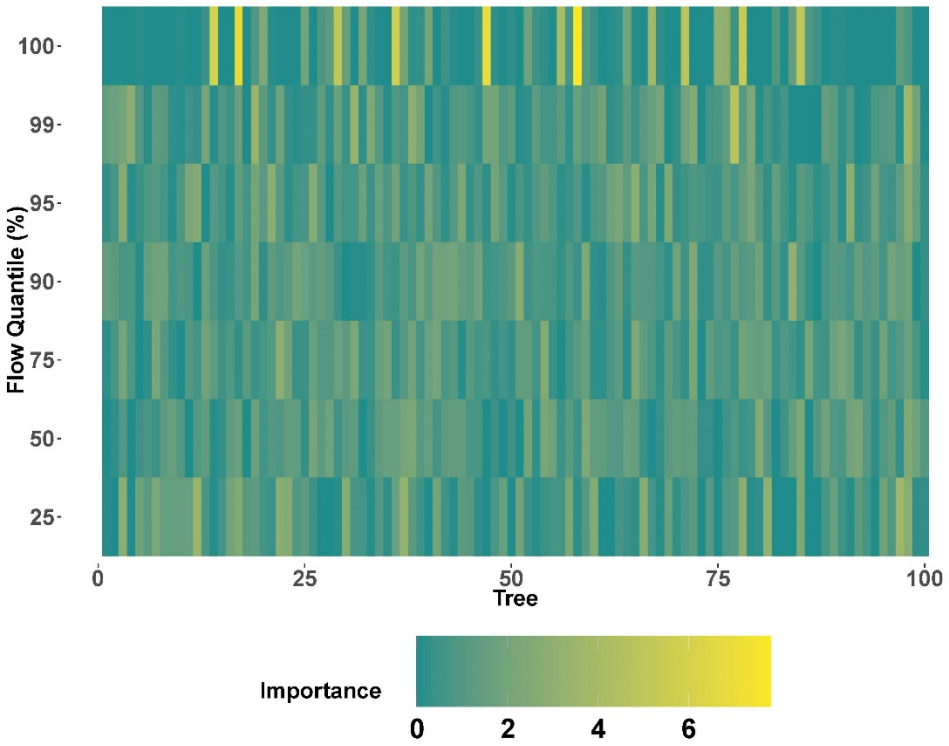

Figure S10: BMA weights of SCE decision trees for the second drainage basin at the Spring irrigation period under seven flow quantile ranges.

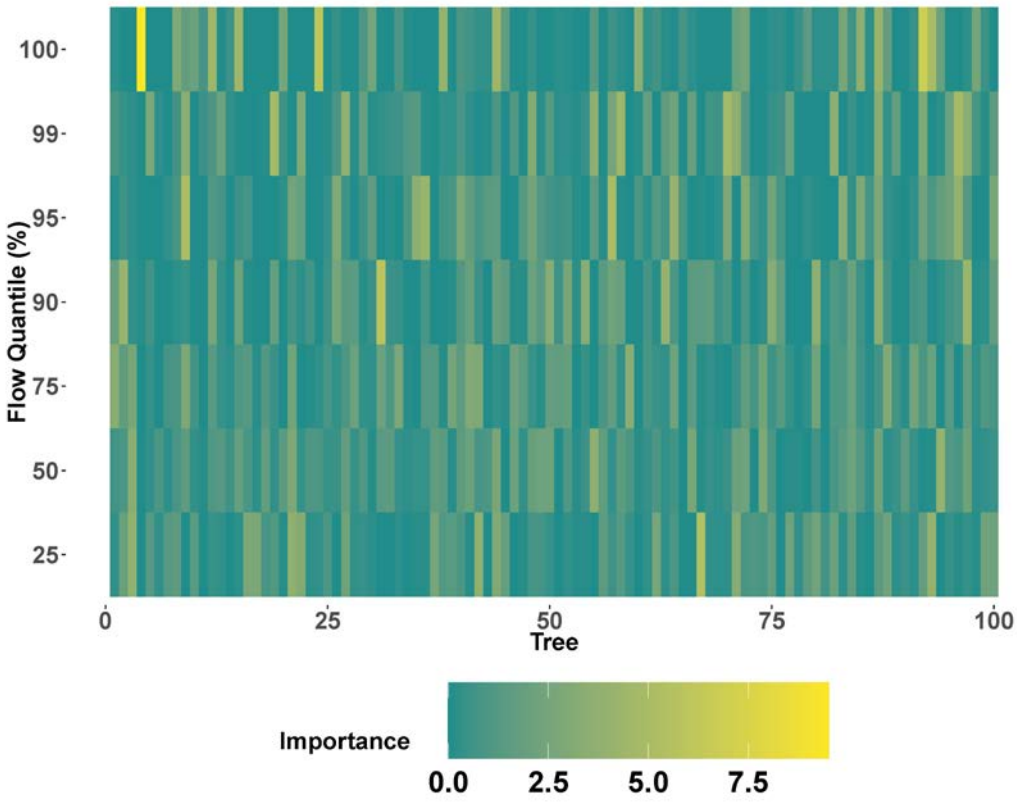

Figure S11: BMA weights of SCE decision trees for the second drainage basin at the Winter irrigation period under seven flow quantile ranges.

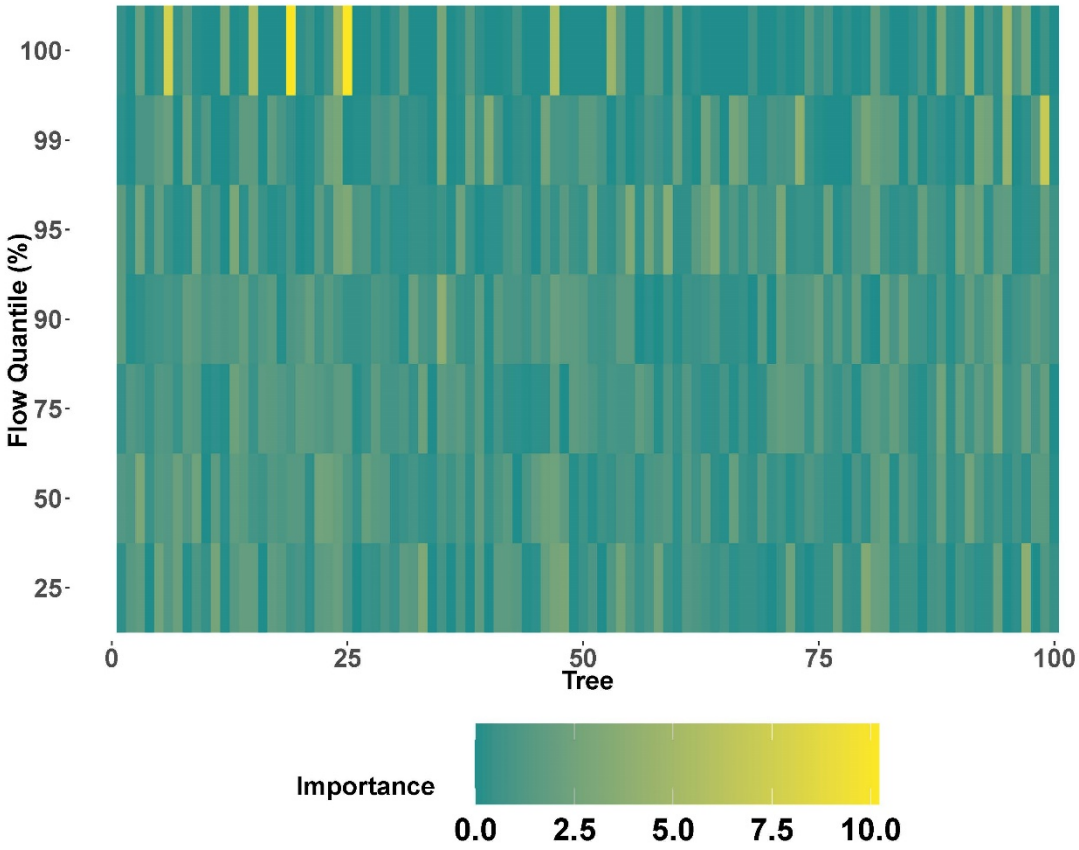

Figure S12: BMA weights of SCE decision trees for the third drainage basin at the Spring irrigation period under seven flow quantile ranges.

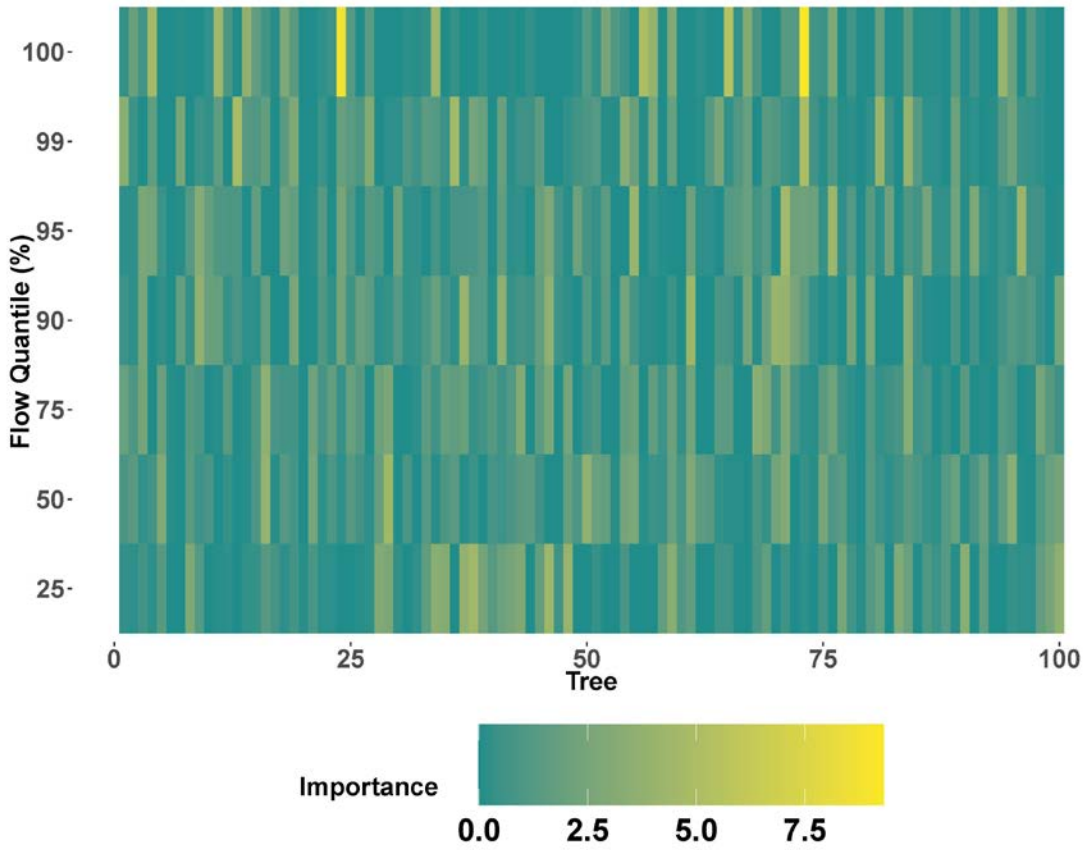

Figure S13: BMA weights of SCE decision trees for the third drainage basin at the Winter irrigation period under seven flow quantile ranges.