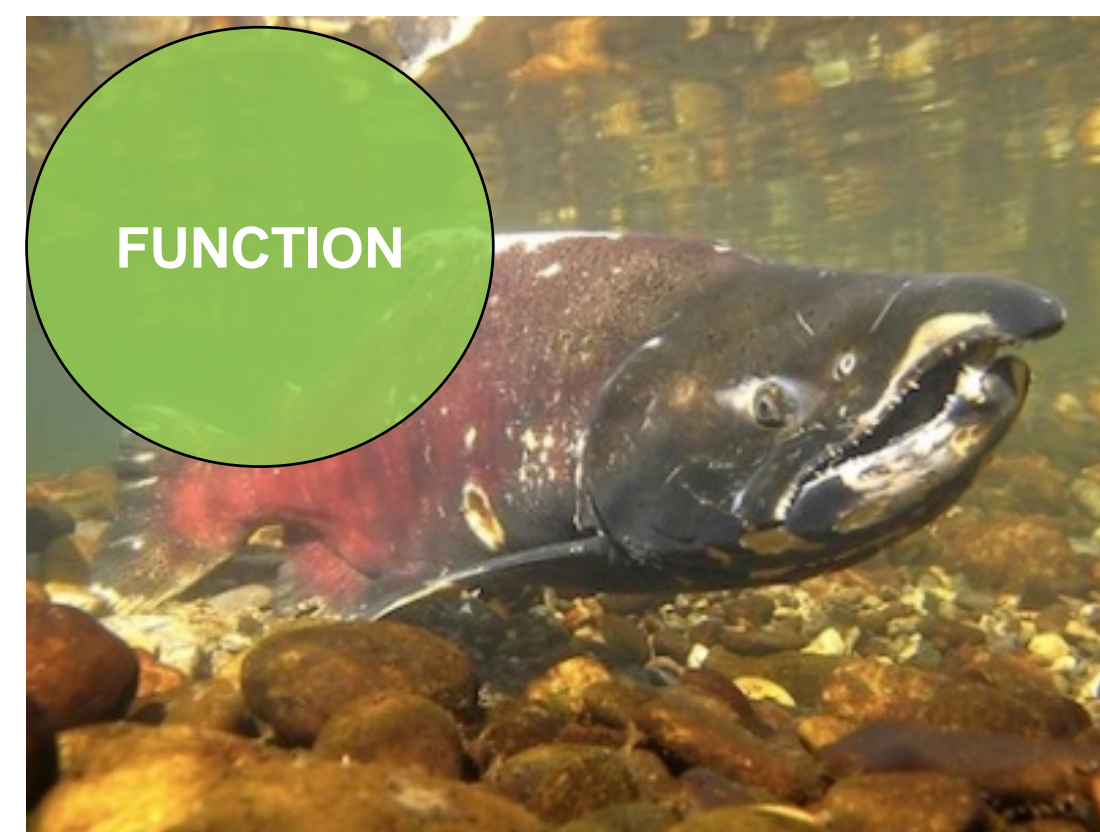
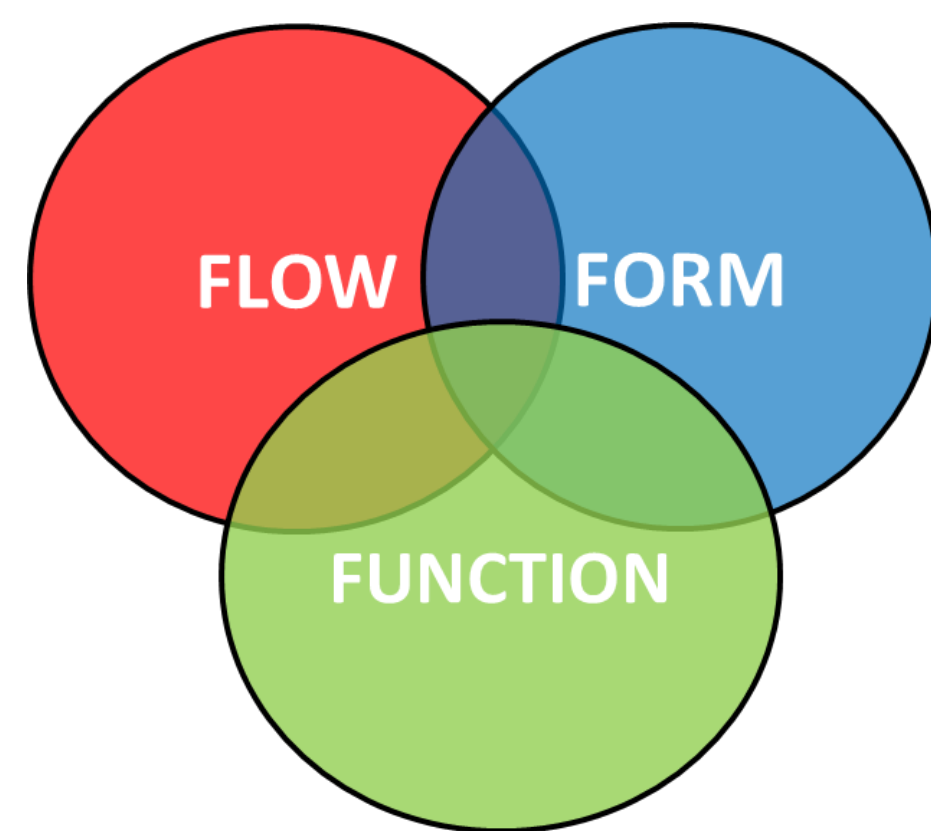


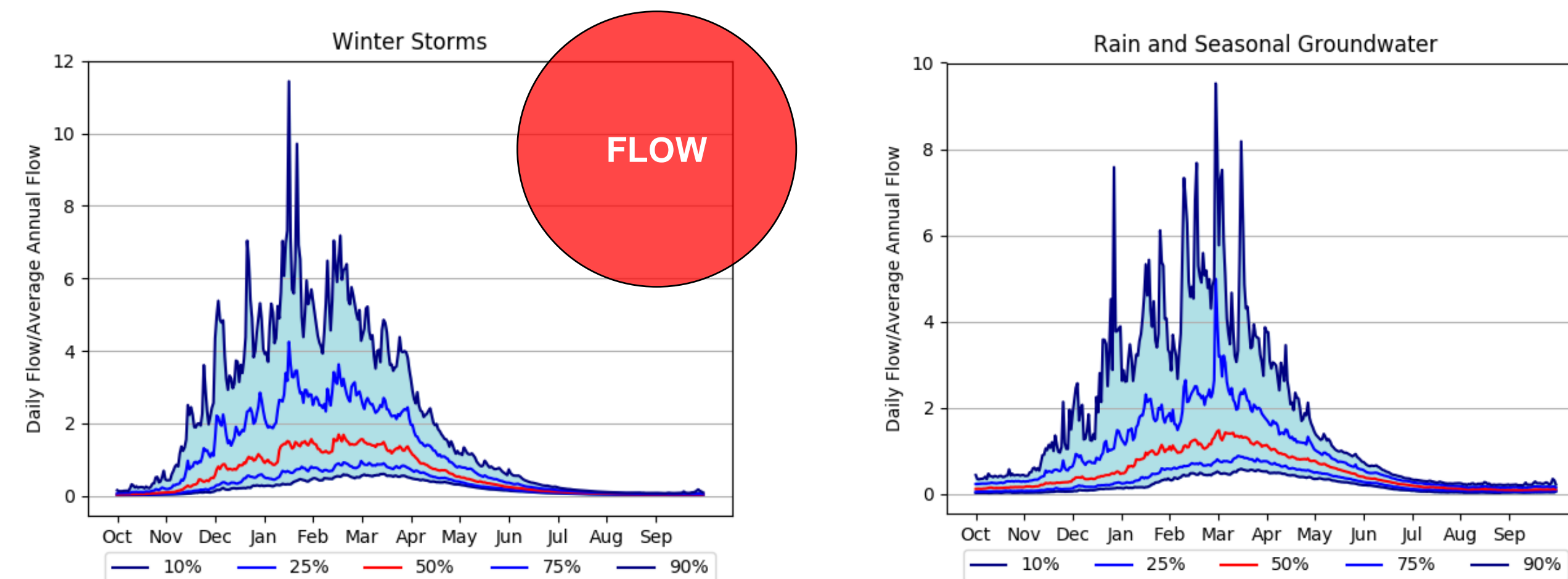
## HOW MUCH WATER DOES A RIVER NEED?

Answering this question is critical for freshwater ecosystems and depends on a flow-form-function nexus : the ecological functions of a river are linked with its geometry and the magnitude and frequency of its flow.



Salmonids require specific bed conditions.

The different hydrological regimes in California rivers have been mapped. (Lane et al., 2017)



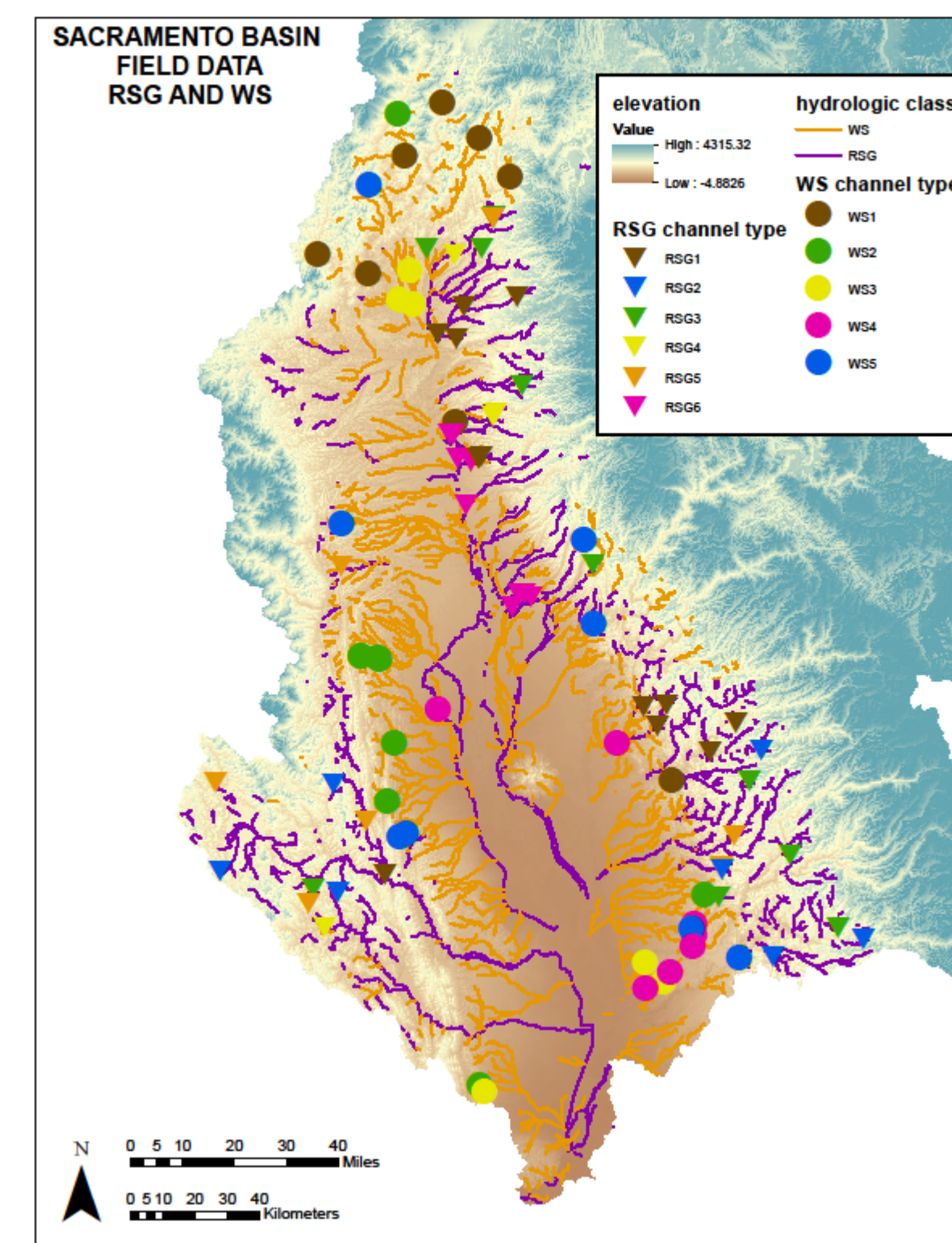
Reference hydrographs.

But, the spatial repartition of channel types is unknown and is needed state-wide.

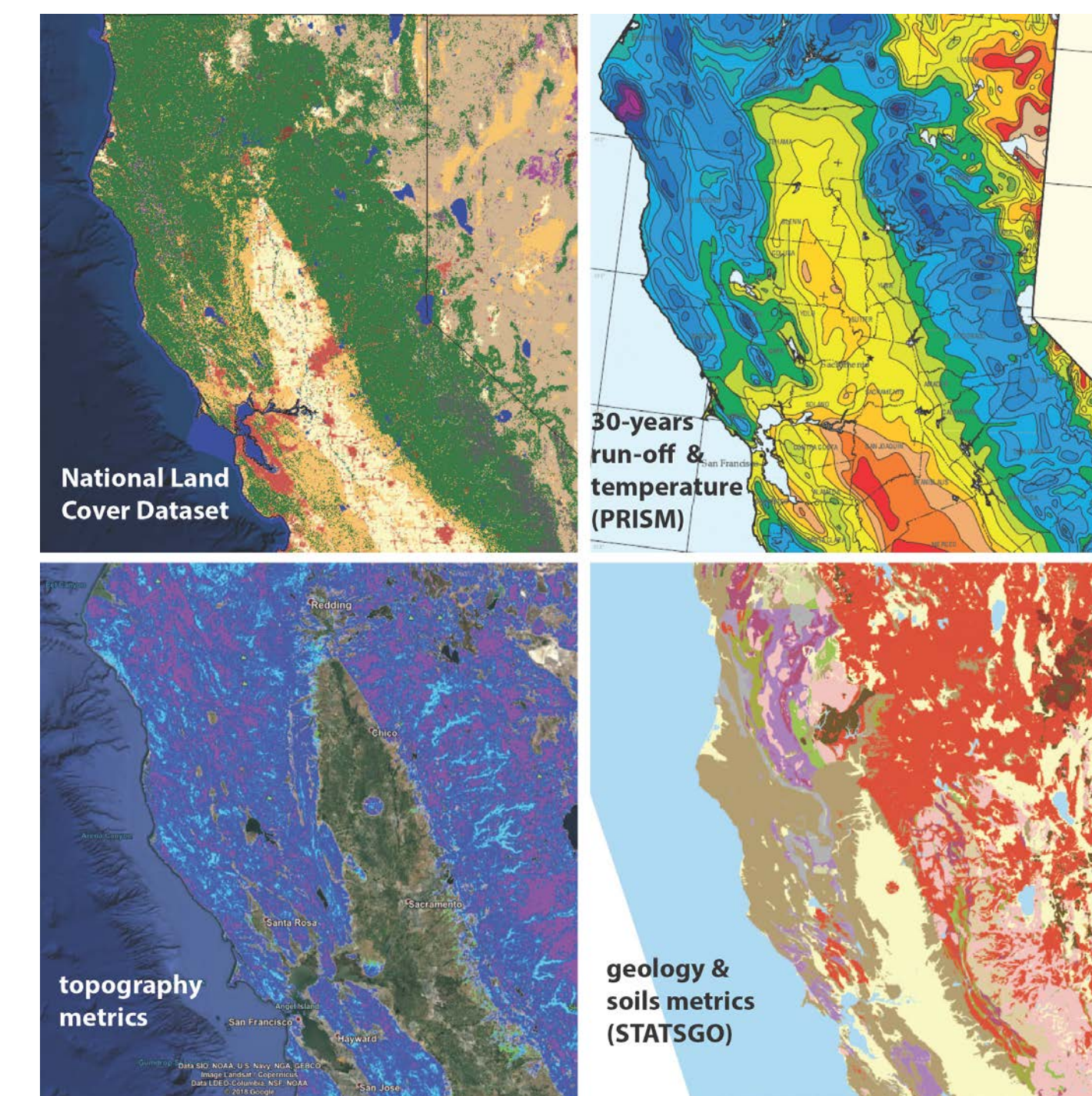


## TRAINING PREDICTIVE MODELS WITH A WIDE-NET APPROACH

- supervised learning and classification
- $n$  labels : stratified random sampling and field surveys ( $10^0$ - $10^2$  m)
- $p > n$  predictors : ~300, remote sensing ( $10^2$ - $10^4$  m), estimated with HPC

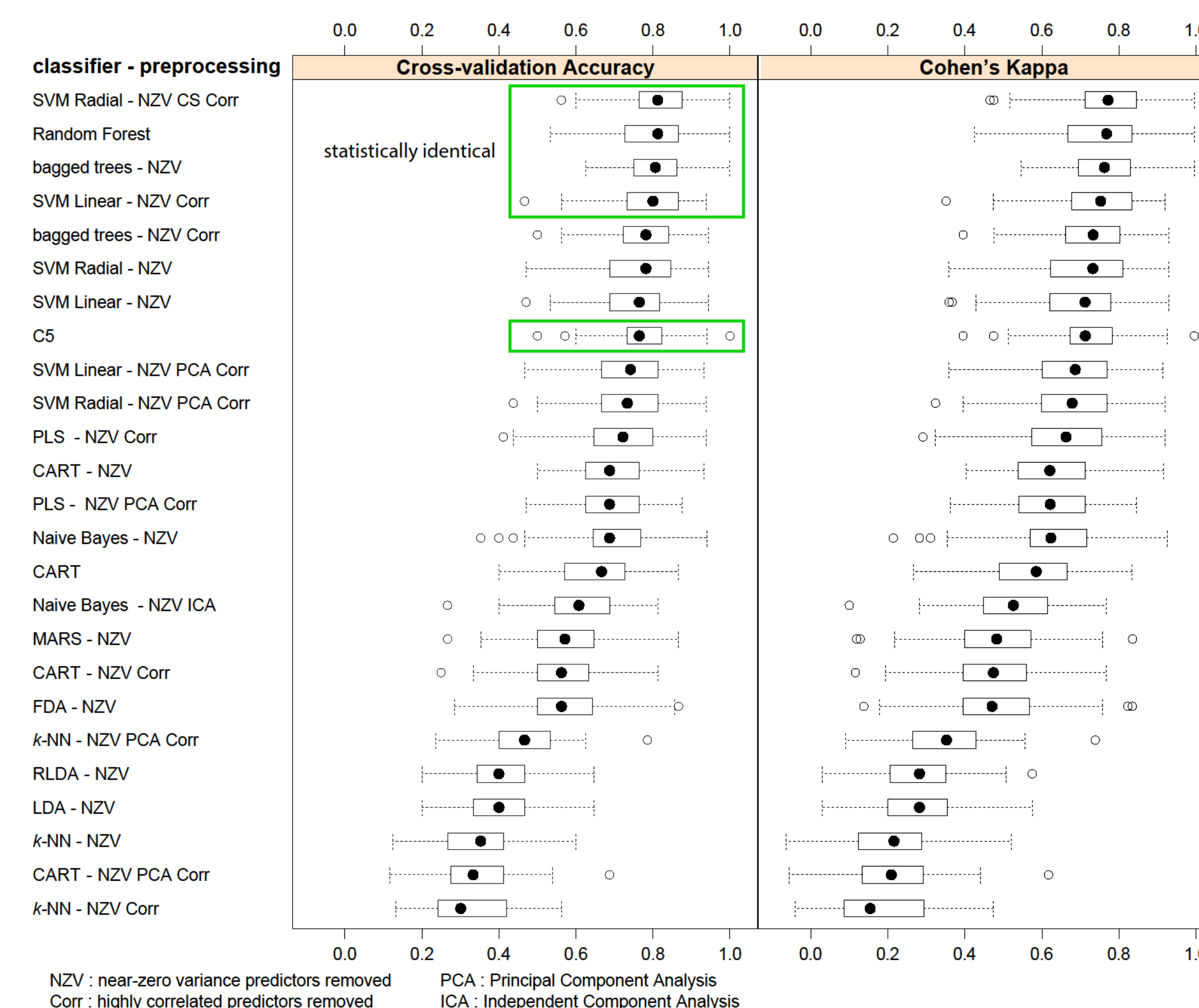


Field data for channel types occurring in RSG and WS hydrological classes.



Predictors are derived from remote sensing data.

- 12 commonly used classifiers are trained in a stream-lined way
- resampling scheme : 20 repeats of 5-fold cross-validation
- pre-processing : centering, scaling,  $k$ -NN imputation
- grid search with a granularity of 20 within an adequate range
- best classifiers are selected with paired  $t$ -tests

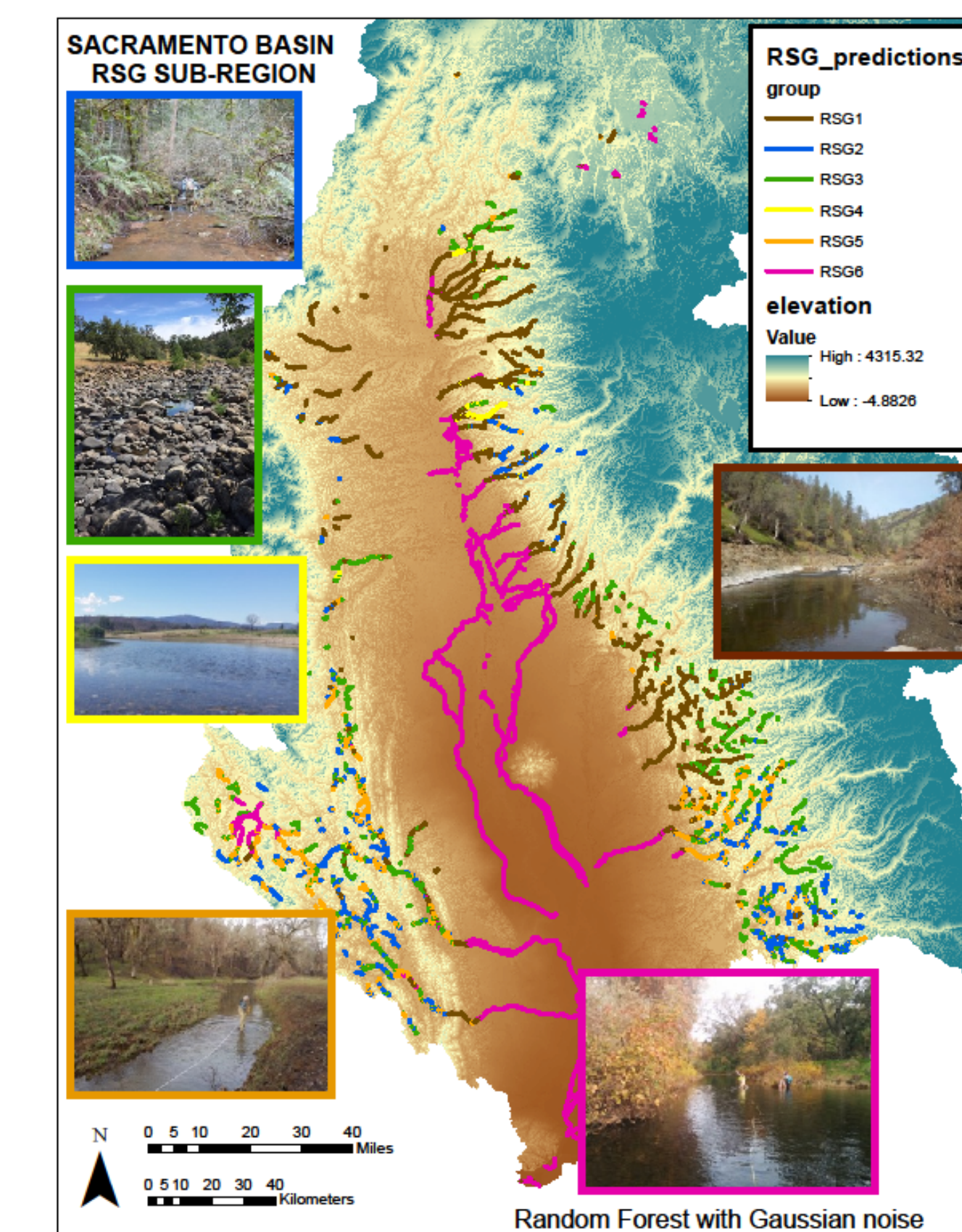
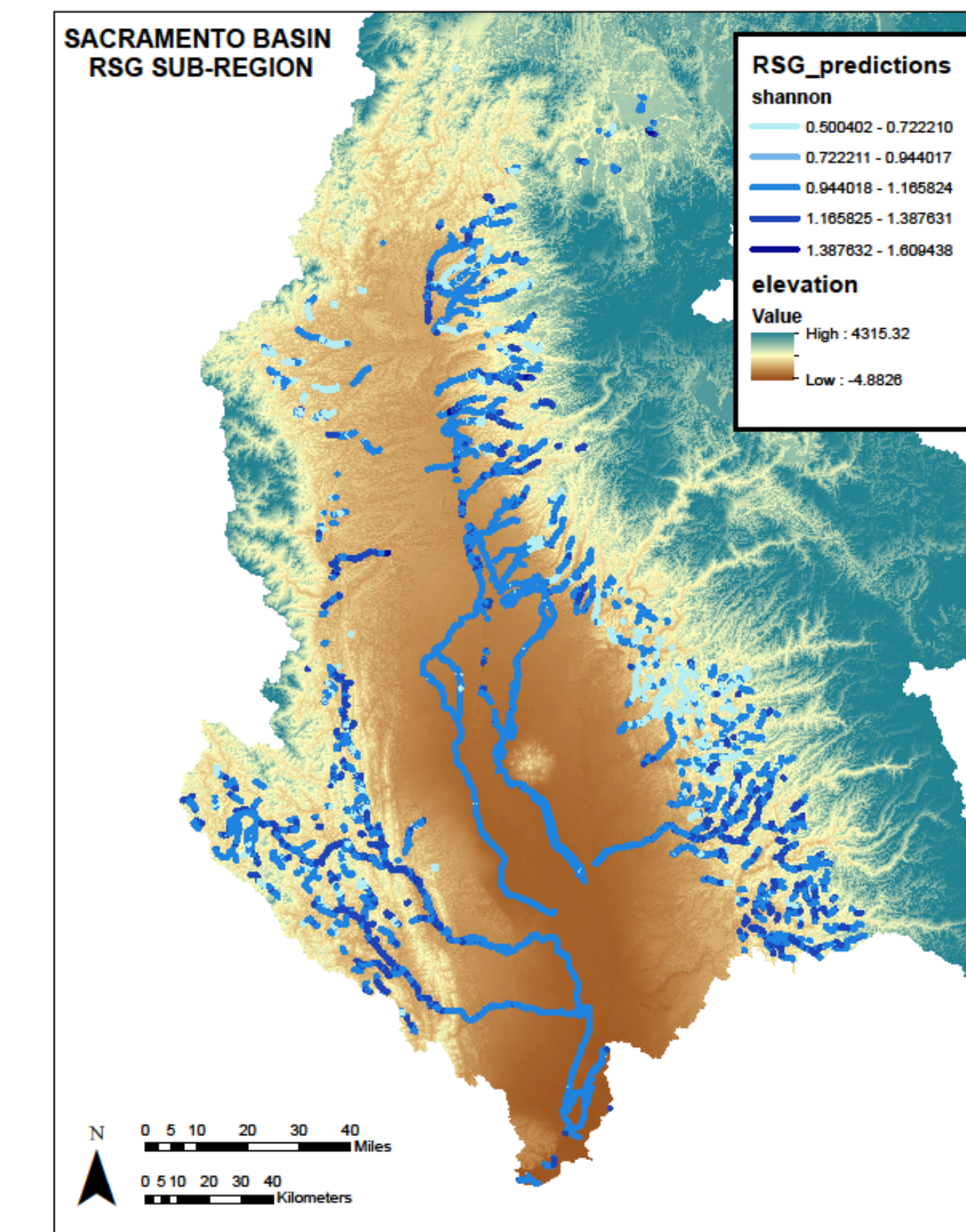


Results of the training process

## PRELIMINARY PREDICTIONS

- The best classifiers have widely different spatial predictions.
- A Random Forest model is able to predict large scale patterns.
- Unstable predictions show that small scale patterns are not well captured.

High values of Shannon-Weiner's index indicate disagreeing predictions.



RSG predictions underline RF model instabilities. WS predictions highlight coherent spatial pattern.

## CONCLUSIONS

- Large scale patterns are captured, confirming the empirical and conceptual understanding of the spatial organization of channel types.
- Small scale hierarchy is not predicted when multiple classes inhabit the same neighborhood of the predictor space.
- These preliminary results provide avenues to solve simpler classification problems in distinct spatial subsets.

## COLLABORATORS



Random Forest predictions capture the large-scale spatial organization of channel types