Developing a Machine learning Regional watershed model from individual Soil and Water Assessment Tool models for Western Lake Erie

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Single machine learning model for predictions across multiple watersheds: more efficient than SWAT

County level flow and discharge of sediment and nutrients

Dissolved Phosphorus in Discharge difference from 2020 to 2040 (%)
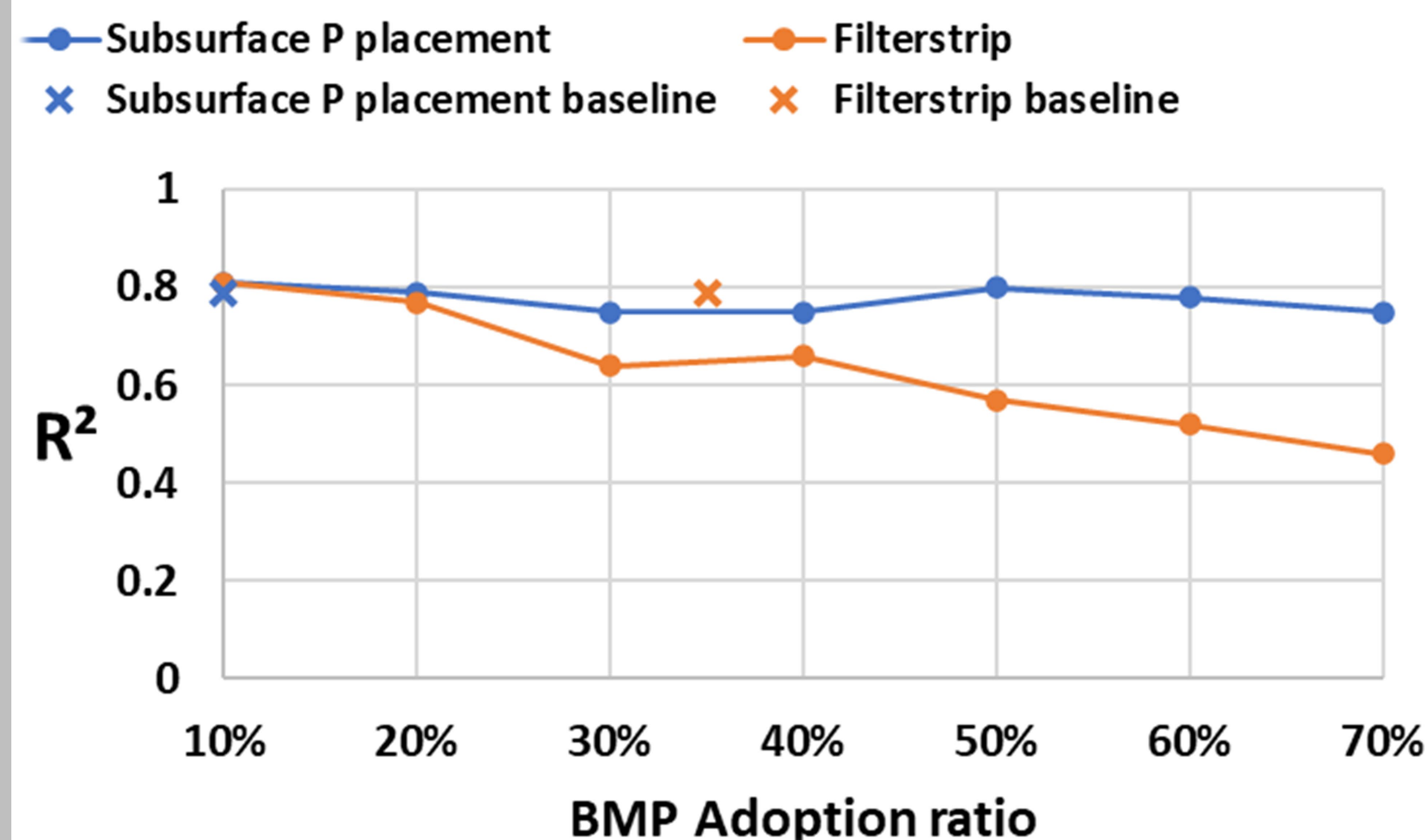0 25 50 75 100

MODEL TEST: MAUMEE RIVER

Calibration statistics at Maumee River mouth for Dissolved Reactive Phosphorus (DRP) are above satisfactory

	Values	Performance evaluation*
Nash-Sutcliffe efficiency	0.65	Good
Percent Bias	-0.01	Very Good

*: based on Moriasi et al. (2015)

Maumee River ML model for DRP works well with different **Best Management Practices** (BMP) adoption ratio
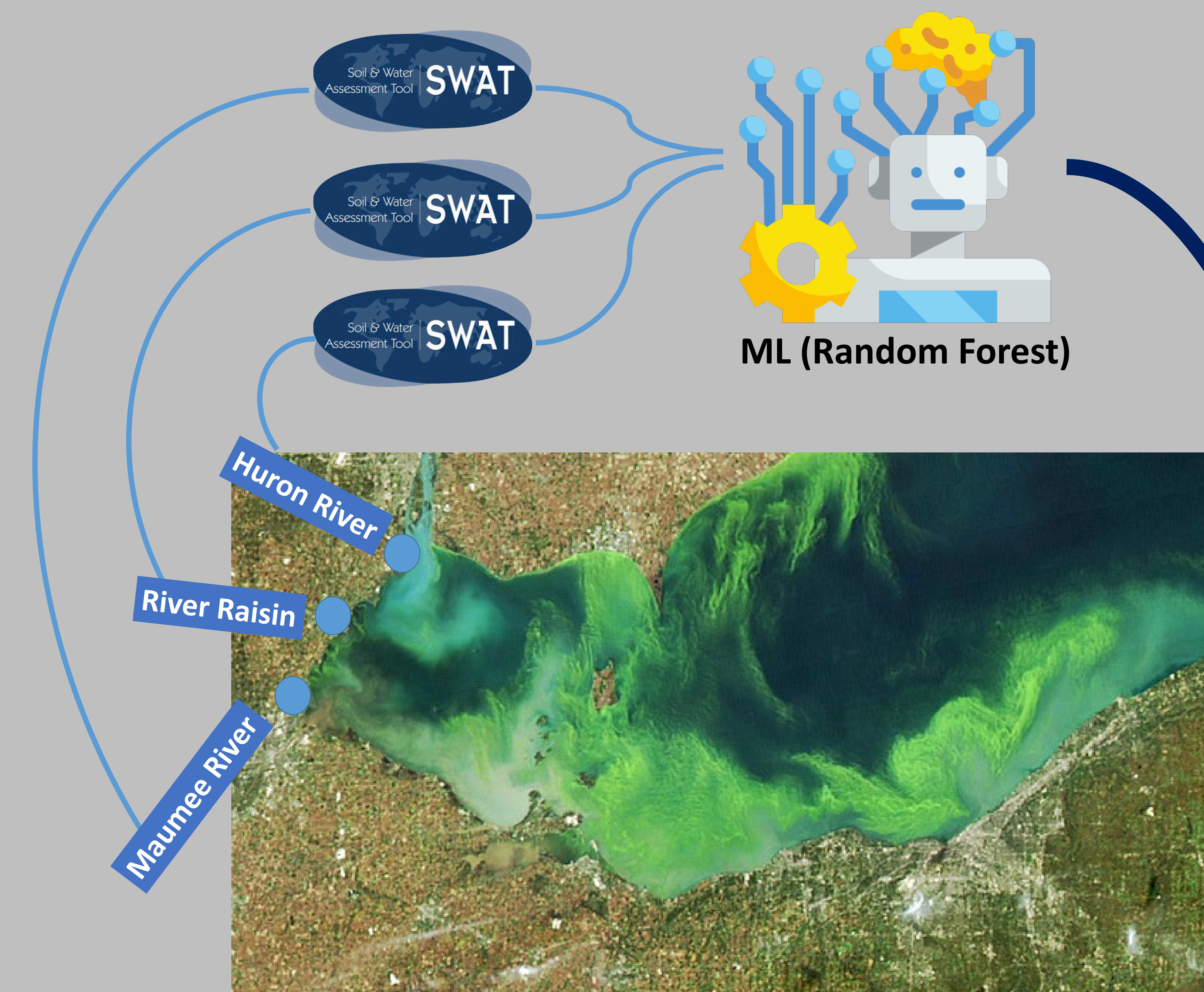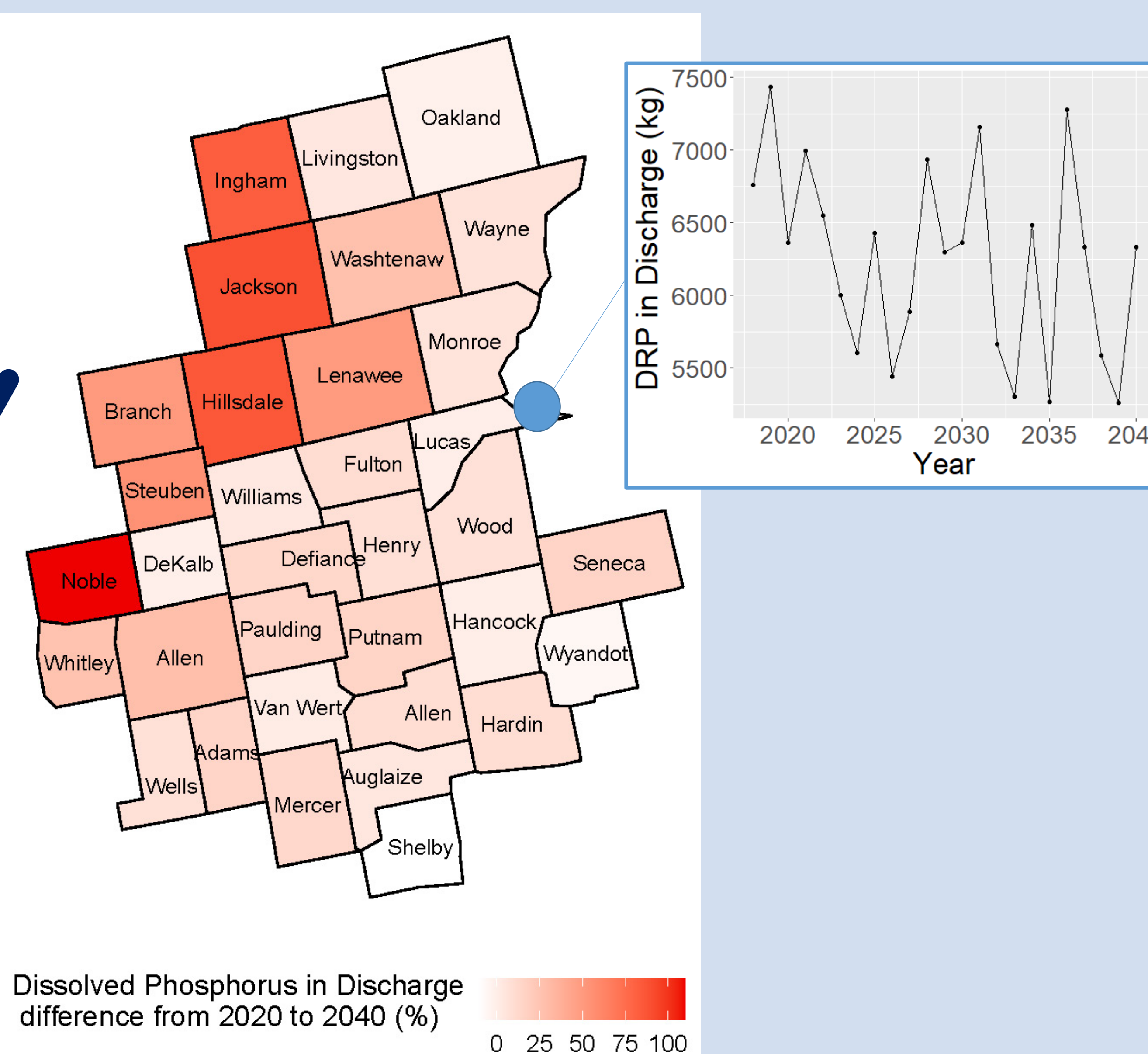

MODEL TEST: WESTERN LAKE ERIE

R^2 values indicate that the ML model can be used in place of three SWAT models
(spatial level: county, temporal scale: monthly)

Train data	Test data	Flow	DRP	TN	TP	SED
75% of three watersheds	25% of three watersheds	0.80	0.88	0.77	0.74	0.51
	Only Huron	0.81	0.71	0.58	0.55	0.67
	Only Maumee	0.79	0.88	0.76	0.73	0.50
	Only Raisin	0.97	0.76	0.73	0.61	0.84

INTRODUCTION

- SWAT is less applicable to problems that require integration or optimization with other models

- Need to develop a surrogate model that is computationally efficient and capable of simulating across multiple watersheds

METHOD

- Random Forest Regression was trained with SWAT result for streamflow, Dissolved Reactive Phosphorus (DRP), Total Nitrogen (TN), Total Phosphorus (TP), and Sediment Transport (SED)

- Model for Maumee River Basins was built and expanded to Western Lake Erie basin, by training three SWAT model results for Maumee River, Huron River, and River Raisin

CONCLUSION

- Model for Maumee River works well for baseline and different BMP scenarios based on calibration statistics and R^2 values

- High R^2 values indicated that the surrogate model could be used in place of SWAT

ACKNOWLEDGEMENT