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Defining spatial and temporal sampling strategies for river velocity and Froude number

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Detailed hydromorphological surveys are often carried out to describe physical habitat characteristics for hydro-ecological investigations and to study the short and long term dynamics of change in response to natural and man-induced flow variability. Fieldwork for these surveys is time consuming and expensive and so it is necessary to examine the most suitable sampling strategy for field data collection and evaluate which parts of the stream are the most sensitive to changes in flow. This study aimed to assess the accuracy of three different sampling strategies (i.e. regular transects, random grids and stratified grids) for predicting velocity and Froude number at non-measured points, and to identify which mesohabitats and flow types better characterise velocity and Froude number changes due to variations in flow.

Velocity, Froude number, mesohabitat (e.g. pool, glide, riffle) and surface flow type (e.g. smooth, rippled) measurements were collected at 2583 points for two different flows (Q=0.517m^3/s and Q=0.344 m^3/s) on the Leigh Brook, Worcestershire, UK. Geostatistical techniques were applied to predict velocity and Froude number values at non-measured points for each flow and for each sampling strategy. Eight different indicators (variogram, mean squared error, mean error, R-squared, residual plots, frequency distributions, cross-sections, mapping resolution, standard error maps) have been analysed to identify the differences between sampling strategies.

The results show that velocity changes due to flow changes are mainly located at deep glide habitat types. Results for Froude number were less conclusive. The anal-

ysis for the comparison of sampling strategies indicates that grid sampling strategies, either random or stratified, give better results than regular transects for prediction of velocity measurements. Since the results also show that higher errors in predictions are obtained in deepest areas (pools-deep glides), higher sampling densities should be applied in these locations.