Variability of *E. coli* in Rivers during base-flow conditions

Richard Muirhead NZFWSS Conference Nelson December 2018





Introduction

Faecal microbe concentrations in rivers vary considerably Not all related to flood events (2 orders of magnitude) Base-flow conditions (3 orders of magnitude)

Samples are typically collected fortnightly or monthly Some at different time-scales No systematic studies across multiple time scales

Development of real-time or near-real-time measurement technologies?



Decision support

Interpretation of grab samples

Decision support tools

Meeting standards





Decision support

Interpretation of grab samples

Decision support tools

Meeting standards





Model calibration

Model calibration

daily average concentrations vs

.

grab samples





What we did and hypotheses

- Winter and Summer
- 3 Rivers
 - small (1st order) to large (6th order)





What we did and hypotheses

Winter and Summer 3 Rivers small (1st order) to large (6th order)

Lab replicates

Colilert and Quanti-tray 2000 method

Temporal scales:

minutes, hours, days

Compared: CoV = Stdev / Mean



Small Trib – winter





Small Trib





Summer





Large River – winter







Large River





24 hours

Silver Stream





24 hours





Coefficient of Variation





Implications: 95% confidence intervals





Implications for model calibrations





Conclusions

High natural variability under base-flow conditions Variability increased with increasing time-scales Some interactions with season and size of river Variability is exaggerated in small streams

- effect of different sites

- implications for interpretation of grab samples Challenges for model calibration



Final thoughts

Variability of pathogens will be even greater

Microbial WQ guidelines are based on data from large rivers What are the Implications for applying these numbers to small streams?

Acknowledgments: Esther Menken, Jen Robson, Janae Hunt, Naomi Pellet and Neil Cox. Funding from Our Land & Water.

Published in a Special issue on Microbial Monitoring and Modelling in JEQ (2018)