

# A SAMPLE COORDINATION METHOD SUITABLE FOR ENVIRONMENTAL MONITORING

Xin Zhao, Anton Grafström

Department of forest resource management, Swedish University of Agricultural Sciences, Sweden

We propose a new strategy for long-term environmental monitoring that has potential to produce superior estimators of both current state of the environment and its changes over time. In this strategy, we combine two concepts known as spatially balanced sampling and coordination of samples over time. Spatially balanced sampling can provide superior estimators of current state, whilst coordination of samples over time is often used to improve estimators of change. Compared with some reference strategies, we show that the new monitoring strategy can improve the precision of the estimators of state and change. A forest inventory application is used to illustrate the new approach and the results can be summarized as (1) using auxiliary information to spread the sample can improve the state estimators; (2) by positively coordinating the samples, we can improve the estimator of change compared with independent samples; (3) a sample only needs to be updated in the next time occasion if the values of the auxiliary variables have changed over time, otherwise we can keep the previous sample at the next occasion. The presented strategy can be used to develop more efficient environmental monitoring programs.

## References

- [1] Grafström, A. (2012). Spatially correlated Poisson sampling. *Journal of Statistical Planning and Inference*, 142(1), 139-147.
- [2] Grafström, A. & Schelin, L. (2014). How to select representative samples. *Scandinavian Journal of Statistics*, 41(2), 277-290.
- [3] Grafström, A. & Matei, A. (2018). Coordination of spatially balanced samples. *Survey Methodology*, Statistics Canada, Catalogue No. 12-001-X, 44(2), 215-238.